SEPTEMBER
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FOUNDRY

A PENTON PUBLICATION

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- Mechanized Line Is Fast, Flexible . . p. 62
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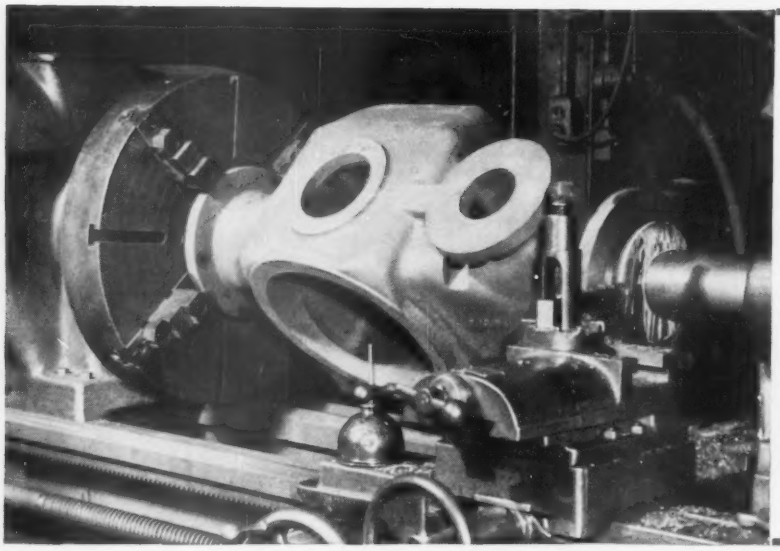
Modernizes Melting Plant

—p. 56

PROVED BY INDEPENDENT LABORATORY TESTS:

42.5% S·M·I*

for FERROCARBO®-TREATED IRON



Finer grained, denser, and stronger castings result from FERROCARBO-treated iron. This has been proved by comparative tests conducted in several independent laboratories on untreated iron and FERROCARBO-treated iron of the same chemistry. Rapid, controlled disintegration of this patented cupola additive by CARBORUNDUM produces a more fluid iron and therefore a more machinable casting due to fewer segregations and chilled or hard spots. Make sure that FERROCARBO has a place in your production picture.

*** Surface Machinability Improvement**

Tool wear tests were conducted with a single point "Carboloy" grade 44A tool on castings machined at commercial speeds. Flank wear was measured with a 20 power microscope.

HOW TESTS WERE CONDUCTED

These outstanding test results were obtained by one independent research laboratory on Molybdenum-Chromium Alloyed Gray Iron cast by a large Midwest foundry, using untreated and FERROCARBO-treated iron of identical chemistry.

➡ WRITE FOR MORE INFORMATION on how FERROCARBO produces more machinable iron regardless of metal composition. Ask for booklet A-1409, Electro Minerals Division, The Carborundum Company, Niagara Falls, New York.

Chemical Analyses	Untreated	Ferrocarbo® Treated
TC	3.36	3.38
Si	2.17	2.19
P	0.12	0.12
Mo	0.60	0.41
Cr	0.39	0.51
CE	4.08	4.11
Cutting speed (ft./min.)	315	315
Feed (in./rev.)	.009	.009
Depth of cut (in.)	.062	.062
Wear Land (in.)	.015	.015
Vol. of metal removed (cu. in.)	3.3	4.7
Percent improvement		42.5%

ELECTRO MINERALS DIVISION

The CARBORUNDUM Company

REGISTERED TRADE MARK

FERROCARBO DISTRIBUTORS—KERCHNER, MARSHALL & CO., PITTSBURGH · Cleveland · Buffalo · Philadelphia · Birmingham · Los Angeles · Canada
MILLER & COMPANY, CHICAGO · St. Louis · Cincinnati

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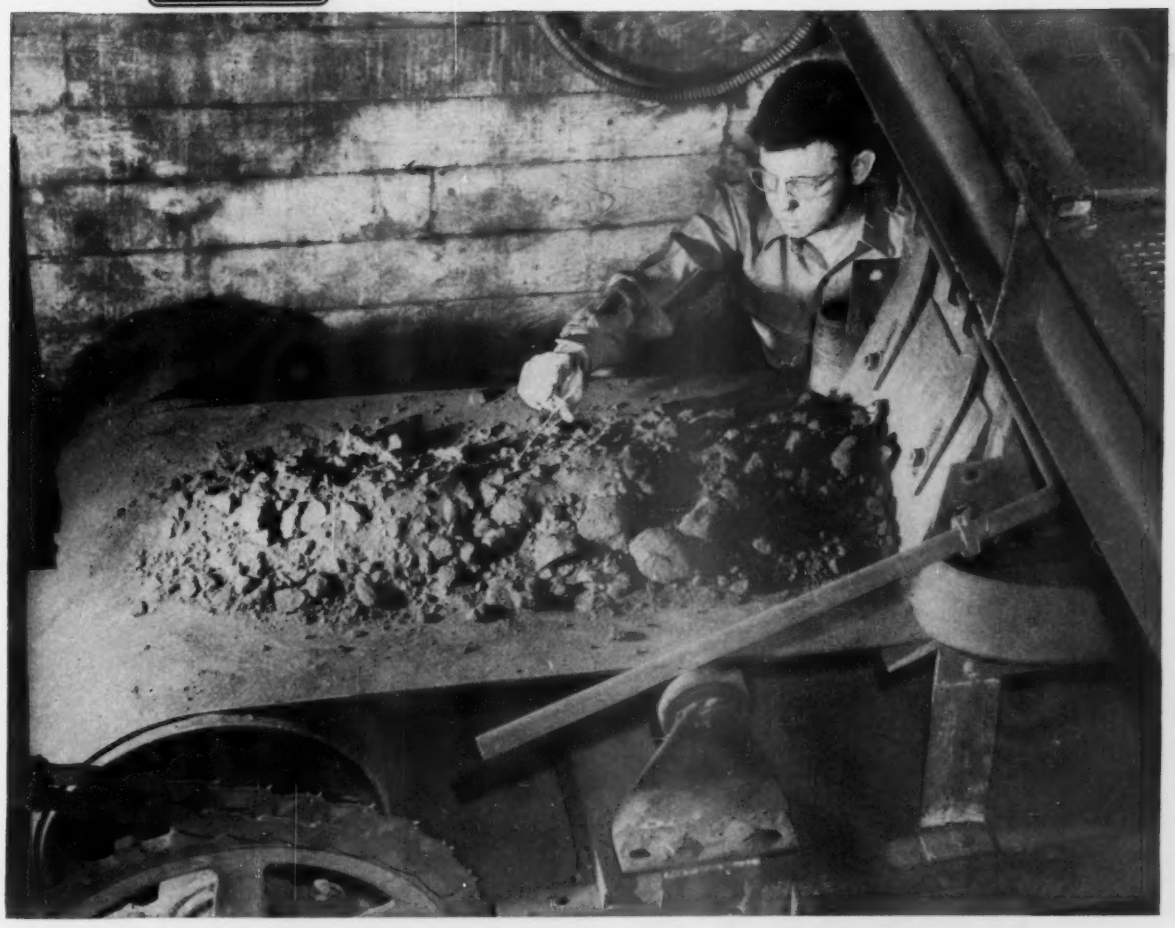
B.F.Goodrich



This B.F.Goodrich belt lasts 8 times longer, cuts costs $3,500

B. F. Goodrich improvements in rubber brought extra savings

Problem: The sand on that conveyor belt is hot enough to bake bread—375 degrees according to the thermometer in the man's hand. It's shaken from red hot castings, dumped on the belt and carried away to be reused. But the scorching hot sand baked belts hard, made them crack and break. Belts needed constant repairs, had to be replaced every three months.

What was done: When a B.F.Goodrich salesman heard of the problem, he suggested a new belt called Solarflex, specially designed by B.F.Goodrich to handle hot materials. This belt is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden, crack, and finally break down. Instead of ordinary fabric, B.F.Goodrich used *glass* fabric (optional) to make a belt that can stand extreme temperatures.

Savings: The B.F.Goodrich Solarflex belt has now given 2 years of trouble-free service—8 times that of previous belts—and still shows no sign of wear. The foundry's maintenance supervisor estimates it has already saved $3,500 in replacement belts alone, and he expects at least two more years' use from the B.F.Goodrich Solarflex belt.

Where to buy: Your B.F.Goodrich distributor has the exact specifications on the belt that solved the problem in this foundry. And as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Department M-427, Akron 18, Ohio.*

B.F.Goodrich *industrial products*

Circle 554 on Page 119

Increasing numbers of cost-conscious foundrymen are intelligently asking, "How much?", as the question relates directly to production results in their plants.

Soul-searching VALUE ANALYSIS is surely welcomed by every serious supplier who has a true value to offer.

ADM, for one, encourages questions relating to the price of our binders, because they offer a perfect opportunity to point up the HIDDEN VALUES rarely appreciated in a unit price . . . the *true* values that express themselves in less scrap, reduced cleaning, faster production, greater profit, and more satisfied customers.

(HIDDEN VALUE NO. 1)

QUALITY...

YOU SAVE WITH ADM's CONTROLLED QUALITY AND UNIFORMITY. Upset the delicate balance of a smooth running foundry by an off-standard batch of binder and you can easily eat up every cent you saved in the original price. The unmatched quality and uniformity of ADM supplies are insurance against profit-consuming errors that reflect themselves in swelling scrap piles and discontented customers.

(HIDDEN VALUE NO. 2)

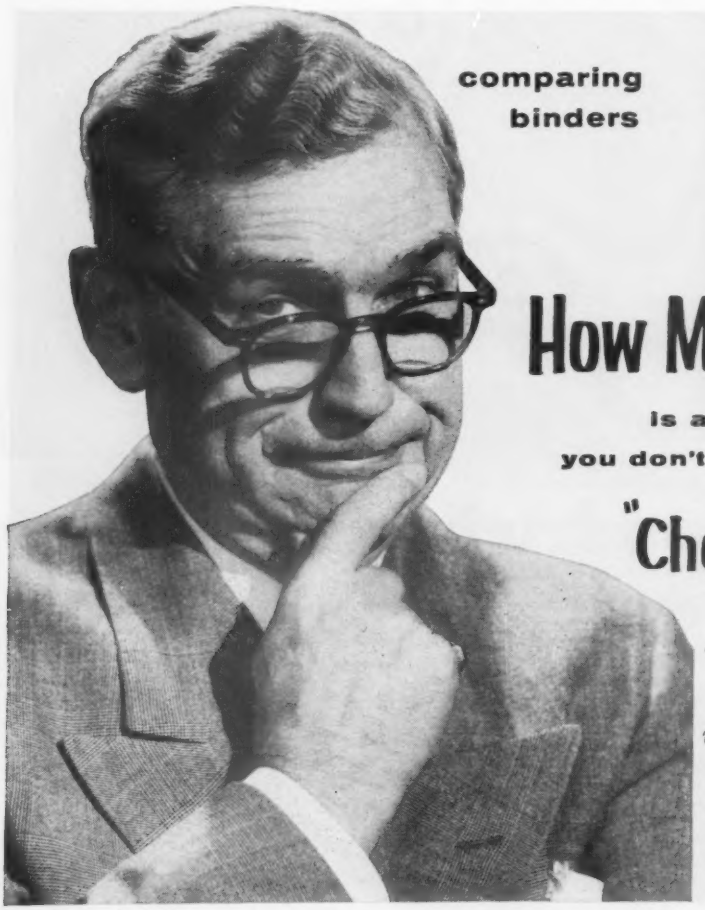
SERVICE...

YOU GET COMPLETE FIELD SERVICE with every ARCHER product. ADM's national organization of experienced Representatives, Product Managers, and Technical Field Service trouble-shooters provide you with specialized counsel when you need it. They keep you informed, too, of the new product developments researched in the ADM laboratories. These trained foundry experts, none of which has "an axe to grind" for any single process, constantly feed you new ideas for speeding production, cutting costs and improving casting quality.

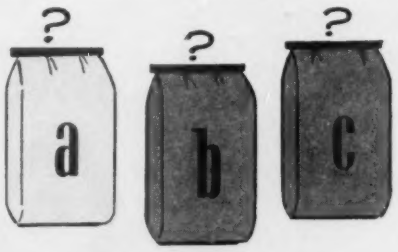
(HIDDEN VALUE NO. 3)

DELIVERY...

YOU CAN TAKE ADVANTAGE of quantity prices and lower freight rates by ordering carloads or truckloads of mixed products instead of paying the "long" price for L.C.L. or L.T.L. shipments. This procedure, which also helps improve your inventory control, is made possible by ADM's complete line of binders, washes, facings, and supplies for every foundry process produced and stocked in conveniently-located plants and warehouses throughout the U.S. and Canada.



comparing binders



How Much a Pound ?

is a good question...IF you don't expect the answer to be,

"Cheapest Price!"

...for cheapest price, attractive as it looks at first glance, usually means a disappointment in quality, service, or delivery.

Archer Daniels Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

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THERE'S HIDDEN VALUE IN ADM PRODUCTS AND THERE'S A PRODUCT FOR EVERY PROCESS

GREEN BOND BENTONITE... for mold facings

ADCOSIL... for CO_2 cores

LINOIL... for oil-sand cores

ADMIREZ... for shell cores and molds

LIN-O-SET... for air-setting cores

and a complete line of FACINGS, WASHES, and SEA COAL

FOUNDRY
A PENTON PUBLICATION

September 1958
Volume 86—Number 9

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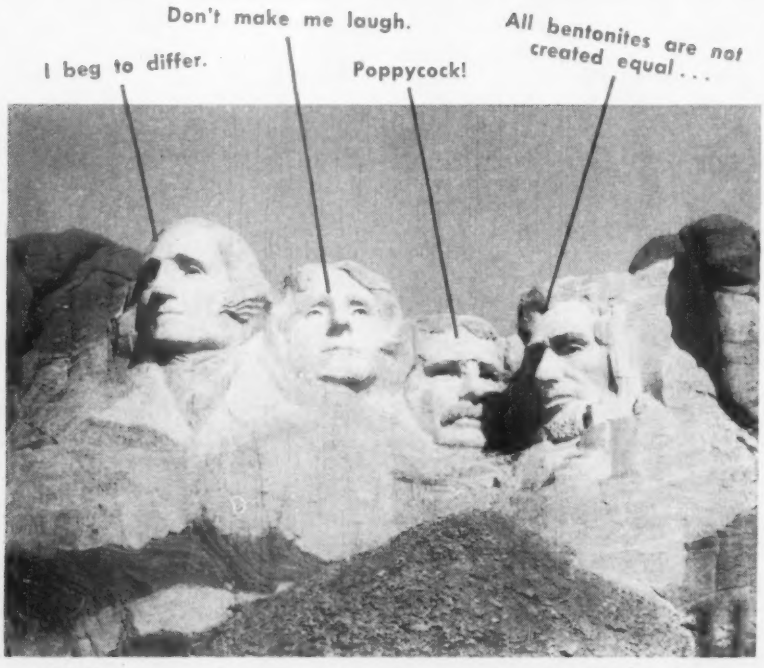
International MINERALS CHEMICALS

A REPORT TO FOUNDRIES

FROM TOM BARLOW

Who says . . .

there's no difference in bentonites?



ABOVE: Four prominent citizens of Mount Rushmore, South Dakota — near the source of Eastern Clay Black Hills Bentonite deposits.

STRONG EVIDENCE

A recent competitive test proved Revivo Core Paste stronger than competing core pastes by 52% to 475%. However, this was just one set of conditions, so the tests were repeated under others. The following table shows the results.

If you study this table carefully, I think you will come up with the same conclusions we have. Namely, each competitive paste tested gives good results under at least one set of conditions — but Revivo is much the strongest under *all* conditions.

Shipment is made from Cleveland, Ohio, in bags or barrels. We'll be glad to furnish samples and quote prices.

PRODUCT	Tensile Strength	Revivo stronger by
AIR DRIED — 9 hours:		
Revivo	116.8	
Paste A	76.8	52.0%
Paste B	64.8	81.8%
Paste C	58.8	98.6%
Paste D	57.2	104.2%
Paste E	32.7	257.2%
Paste F	26.8	335.8%
Paste G	20.3	475.3%
AIR DRIED — 20 hours:		
Revivo	138.8	
Paste B	104.6	32.6%
Paste A	93.2	48.9%
Paste F	78.8	76.1%
Paste E	77.5	79.1%
Paste D	75.0	85.0%
Paste C	61.2	126.7%
Paste G	47.1	143.0%
OVEN DRIED — 30 min. at 225° F		
Revivo	96.8	
Paste D	85.6	13.0%
Paste A	58.4	65.7%
Paste B	50.0	93.6%
Paste G	49.8	94.3%
Paste E	48.4	100.0%
Paste F	32.7	196.0%
Paste C	23.5	311.9%

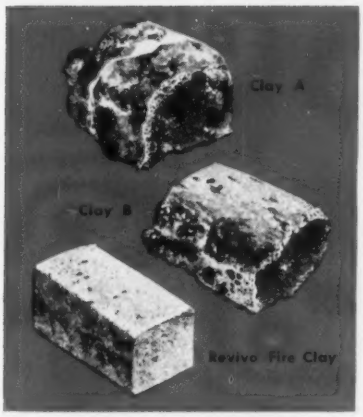
Too often, foundrymen seem to feel that bentonite, whether it be western or southern, depends only on the "hole in the ground it came out of." Unfortunately (or fortunately, as the case may be) this is far from true. We don't feel that you can say "bentonite is bentonite" any more than you can say "pig iron is pig iron" or "cast iron is cast iron" or "steel is steel."

Some foundries have better control than others. Off the same pattern, they will produce a casting which somehow is a little closer to what the customer wants. It may be essentially the same as the competitor's. But there are minor points which make the customer happier with that casting than with the one produced by your competitor. We believe that difference is a question of quality control.

It is for that reason we boast about our laboratory control, our technicians, our geologists and our extensive research laboratories. All of them work to give you a product with which you are satisfied, and of which we can be proud. Bringing you a good bentonite involves selection, testing, evaluation, discrimination, blending (and its opposite, segregation) under carefully controlled conditions. All with good judgment and complete honesty.

We are as proud of our ability to produce good clay as you are of your ability to produce good castings. Furthermore, we know we can do it every day, week in and week out, month in and month out, year in and year out. We have the best resources to draw clay from. We have the know-how to treat it properly. We have the quality control instruments and manpower to package only the best. Above all, we have the "desire to serve" which guarantees you reliable supply.

The Ways of Clays...



It's a crying shame that some people treat or think about fireclay as a country cousin. In most places, the freight costs more than the clay itself. But ask the man who uses it, and you'll get quite a different picture. To him, it's important that the clay be easy to use and handle, and permits him to do a workmanlike job with minimum effort.

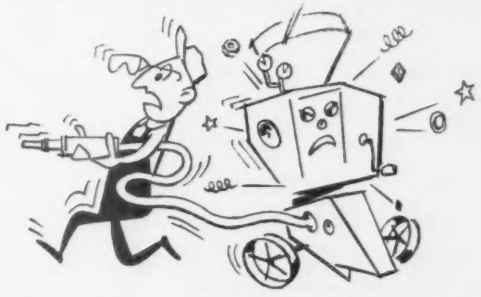
On the other hand, someone else in the organization may feel that the high refractory value, high plastic strength and other quality features are more important. No matter whose side you're on, our clays — Revivo, Lawco and Bondact — are your best buy.

These fireclays are high in true clay content, so they slake or soften rapidly in water . . . can be used immediately after mixing. Silicious and sandy clays, by contrast, are usually hard and slake slowly. It's necessary to soak them for hours before they can be used.

Hard, slow-slaking clays must be ground rather fine if full efficiency is to be obtained. The cost of any fireclay at the pit depends on the fineness of the grind. Coarse, soft clays slake as fast as fine, hard clays. Therefore, a first-quality *soft* fireclay may be purchased at no higher initial delivered cost than a third-quality *hard* clay, even though the freight rate on the quality clay may be higher.

EC1-88

Less b-b-bounce to the ounce



Having no motivational research people to pry into your subconscious mind and interpret your dreams, we were surprised to find that most foundrymen are buying our new Cupolinor not just because it's a one-man machine. Many are impressed by the lower rebound — and therefore, more economical operation.

With this one-man machine, there's no surge from one hopper to the other. Eliminating this temporary pressure drop means that there is a more continuous flow of material. This more than permits the operator to maintain a constant moisture which, in turn, gives him a reduced rebound.

In addition to that, the smoothness of the Auger-matic feeding surpasses that of any machine ever developed . . . even our own feed wheel design. Auger-matic feeding gives you a perfect and steady control over the rate of feed. When it is set for a certain speed, it holds it uniformly and smoothly. In fact, it is so smooth that it's almost impossible to tell whether the machine is running or not. No longer do you see jumping, jerking and pitching of the hose that has been seen in so many past designs.

Actually, the jumpy, twitchy hose in other machines is not always inherent, but rather indicates a lack of perfect adjustment. This is a communication problem. It is difficult for the operator in the cupola to tell the man at the machine his requirements of feed rate and pressure. Lacking a walky-talky, he has no control over rate of feed or pressure.

With a one-man machine, the operator is his own boss and makes his own destiny. If he wants faster feed, he gets it; if he wants a change in pressure, he has it at his fingertips. As a result, he can adjust the smoothness and flow to the point where his rebound is drastically curtailed.

Auger-matic feeding makes a good operator out of an amateur . . . an even better operator out of a good one.

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Creators of Living Minerals

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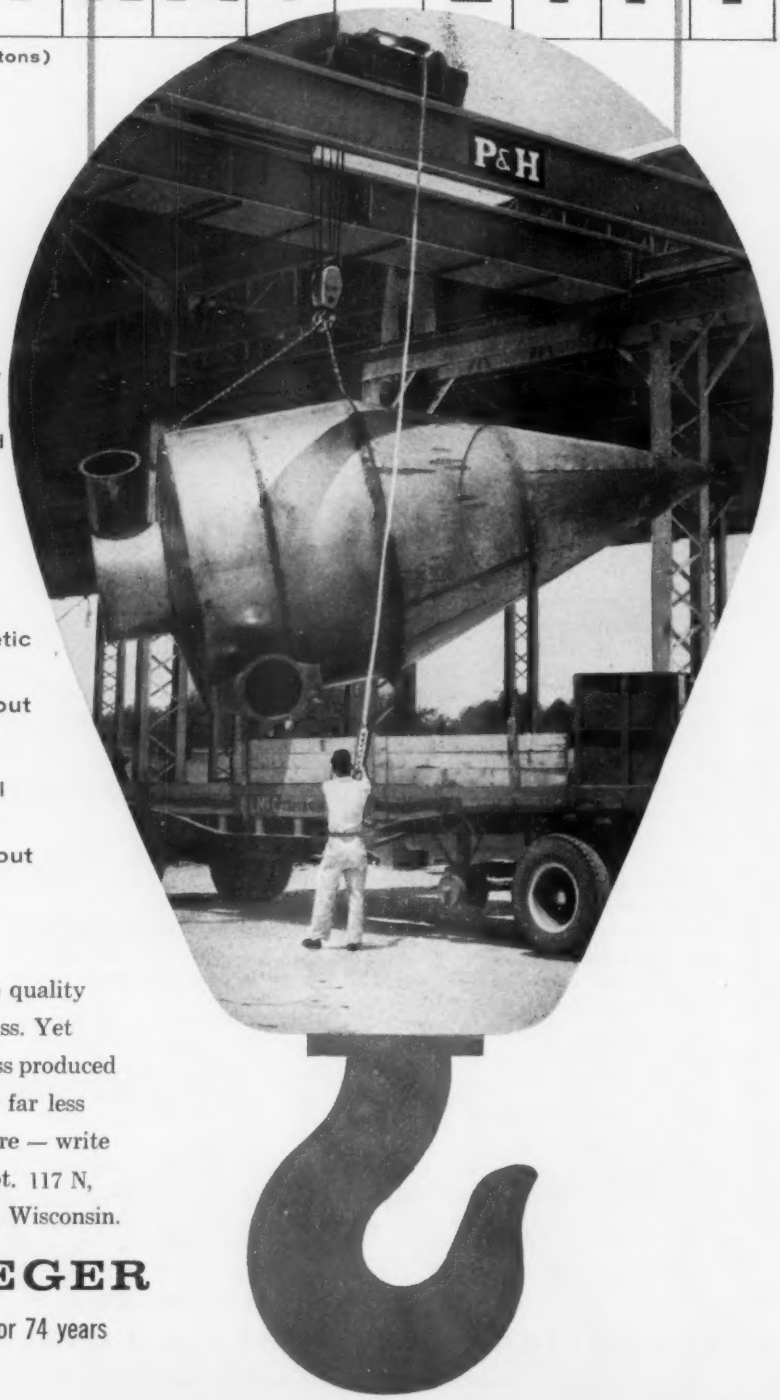
COMPARE SPECS

and you'll see why your best crane buy is

P&H TRAV-LIFT

(capacity 1 to 20 tons)



COMPARE FIRST... THEN SPECIFY

- P&H one-source responsibility for **all** parts and service
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Only P&H Trav-Lift offers all these quality features in the 1 to 20 ton crane class. Yet because it is standard-built from mass produced parts, you can own a Trav-Lift for far less money than you think! Find out more — write for Trav-Lift Bulletin C-51 to Dept. 117 N, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

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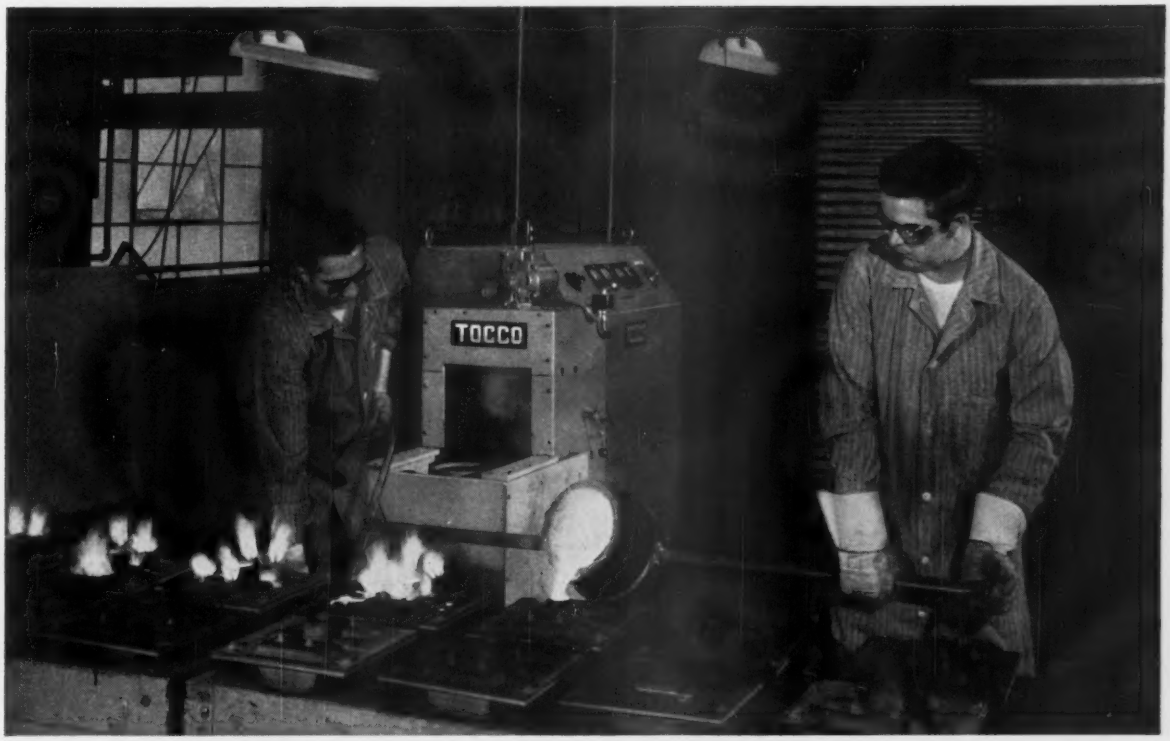

TOCCO* Induction Heating

melts bronze aluminum and stainless steel for high-precision, porous-free castings

Morse Instrument Company, Hudson, Ohio, manufacturer of marine hardware and control instruments, recently switched from conventional furnaces to TOCCO Induction Melting. Results: greater speed, better working conditions and, above all, purer, sounder castings.

"Castings are free from porosity since we switched to TOCCO Induction Melting," reports president John Morse. "This is a sales advantage to us and a tremendous quality advantage for our customers."

Whether you're interested in melting ferrous or nonferrous metals, TOCCO Induction Melting offers you these important advantages:

- **Stepless Power Control**
- **Extremely Rapid Melting**
- **High Efficiency—Even on Intermittent Operation**
- **Good mixing because of Natural Agitation**
- **Extremely Low Alloy Loss**
- **No Contamination when Composition of Charges is Changed**
- **High Reproducibility of Results**
- **Minimum Space Requirements**
- **No Special Installation Charge**
- **Simple, Safe Operation**
- **Clean, Comfortable Working Conditions**
- **No Carbon Pick-up**

If any of these advantages suggest economies in your operations, write for full details—no obligation, of course.

Sample castings produced by Morse Instrument Company with new shell molding process and TOCCO Induction Melting.

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Please send copy of "The Case for TOCCO Induction Melting".

Name_____

Position_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

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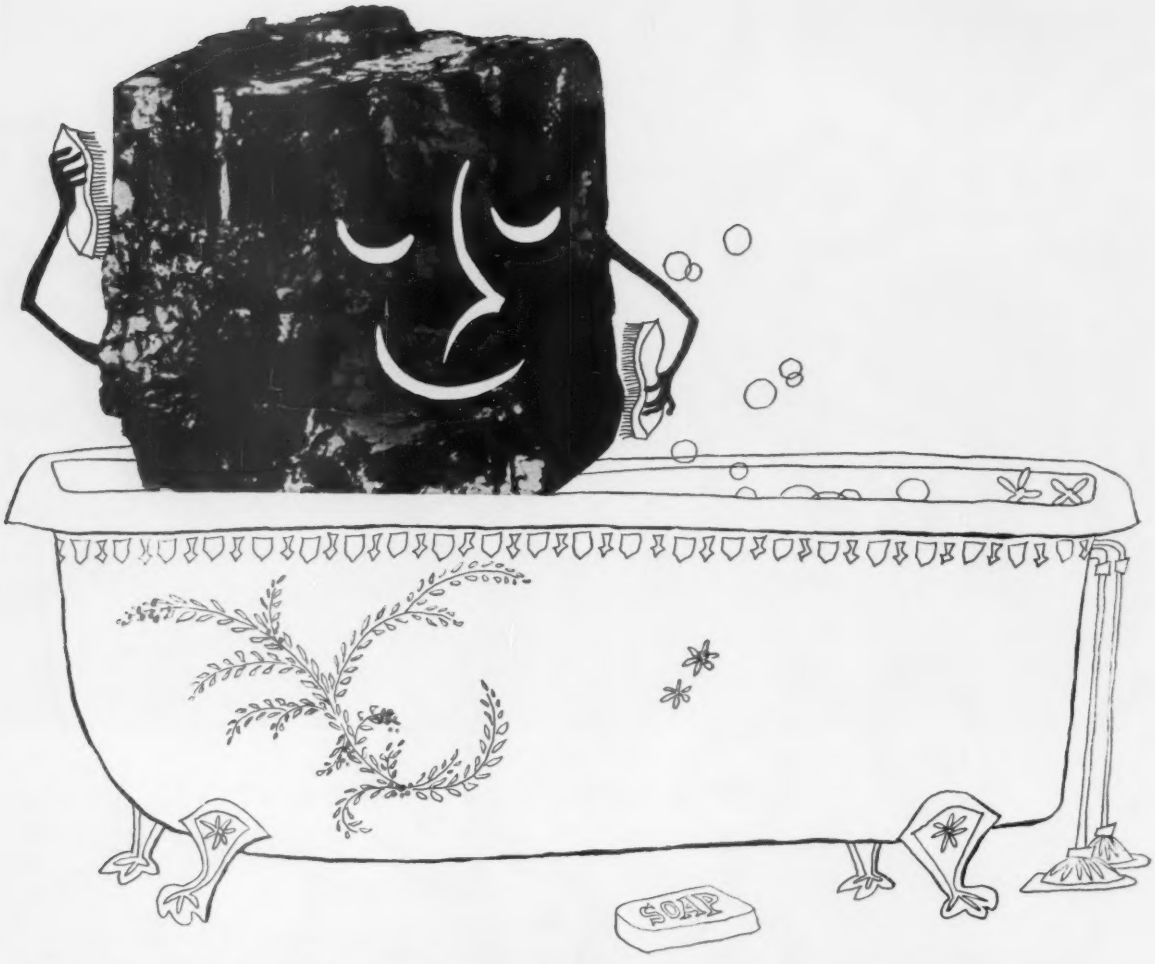

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THERE's a good reason why every ounce of coal is washed before it's used for making *Neville* Foundry Coke. Washing coal helps remove impurities such as ash. By using clean, washed coals—including a high percentage of low volatile Pocahontas—Pittsburgh is able to produce foundry coke that is denser, stronger, more uniform—with a higher percentage of fixed carbon.

And these are *exactly* the qualities you need in foundry coke to produce a hotter, cleaner, more fluid iron with a higher yield of quality castings.

We're *so* sure of the quality of *Neville* Foundry Coke that we guarantee it to meet your rigid specifications. We'd like to talk over *your* coke requirements. *Call or write today!*

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Neville Pig Iron and Neville Coke for the Foundry Trade

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

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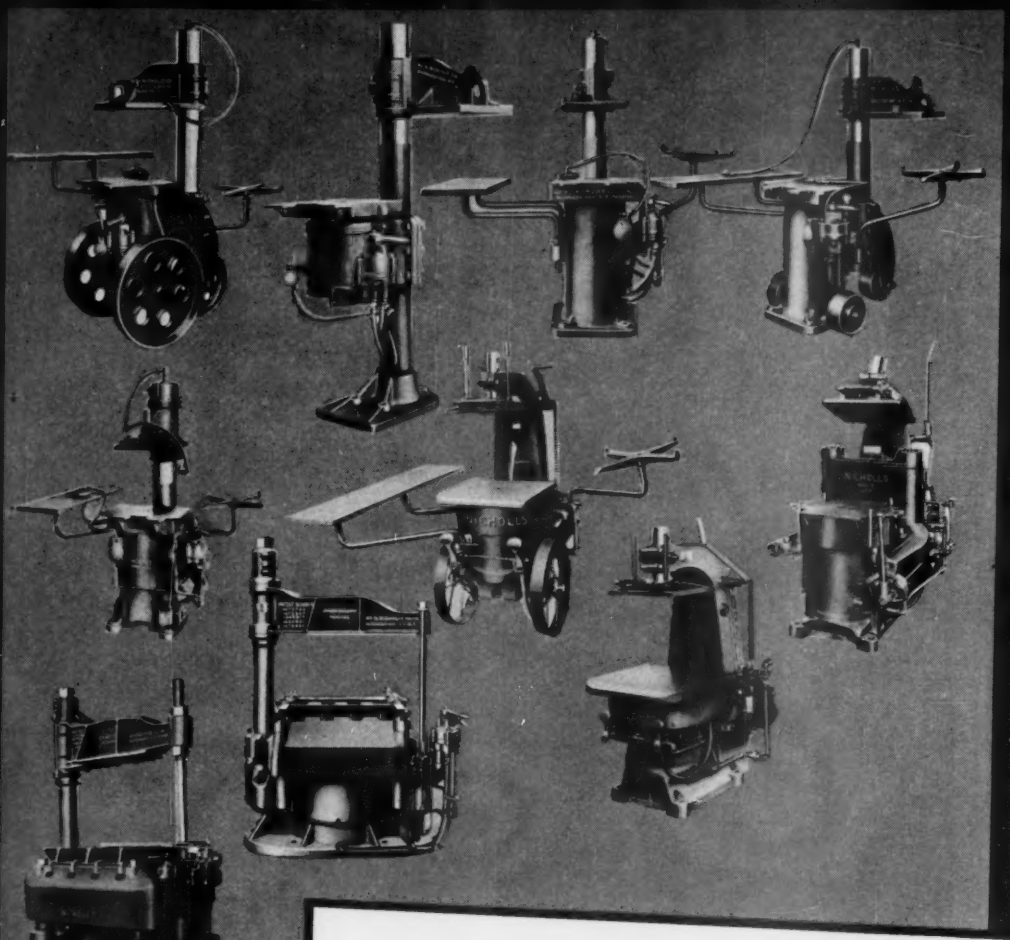
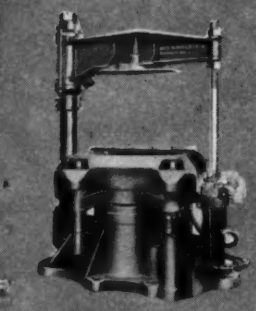
Circle 560 on Page 119→

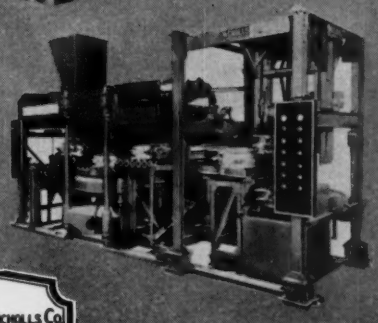


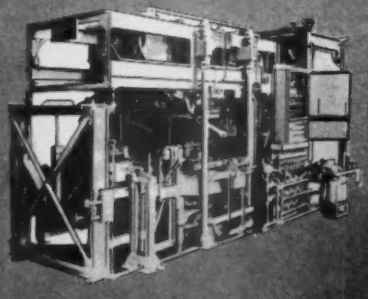
- Accurate, uniform molds . . . true to pattern . . .
- Smooth, sensitive operation . . . dependable performance
- Long life
- Low upkeep
- Simple controls
- Push button or manual operation
- Automatic Jolt & Squeeze timing
- Permanent alignment
- Forced lubrication
- Sections heavily ribbed for added strength
- Guide pins and bushings steel hardened and ground
- Pneumatic pattern draw

FOR HALF A CENTURY MANUFACTURERS HAVE DEPENDED ON NICHOLLS FOR THE BEST IN MOLDING EQUIPMENT.

Large or small, stationary or portable, manual or automatic, Nicholls Molding Machines are precision engineered to give you better molds at lower costs . . . to eliminate dangerous risks, save manhours, increase production.







On Automatic Machines

- Air-operated car-type squeeze heads
- Built-in flask, roll-in roll-out device
- Measuring sand hopper
- Flask feed-in elevator
- Flask indexing device
- Sand spill upset
- Mold turnover and transfer

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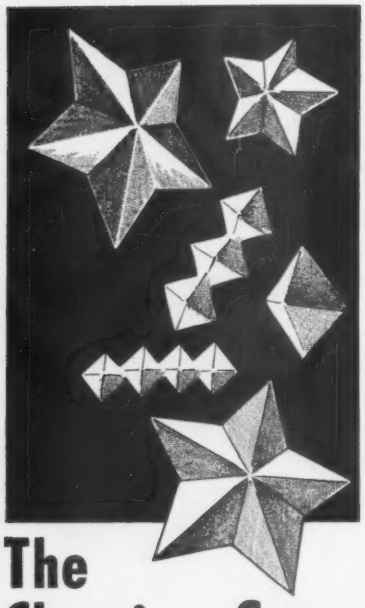
•

Virginia 9-0064



The Cleaning Stars

of ABMET, an abrasive resistant metal, last many times longer than chilled or hard iron. A trial order at these attractive prices will convince you.

ABMET STARS

SIX POINT STARS

1″	$300.	per	ton
1¼″	280.	″	″
1½″	260.	″	″
2″	220.	″	″
2½″	220.	″	″
3″	220.	″	″

FIVE POINT STARS

1¼″	$280.	per	ton
2″	220.	″	″
2½″	220.	″	″
3″	220.	″	″

F.O.B QUINCY, OHIO

AGRICULTURAL ABMET BEARING METAL

QUINCY FOUNDRY INC.

QUINCY, OHIO

Circle 561 on Page 119

With the Editors

SBME: Since October, 1950, FOUNDRY has carried the symbol of the Society of Business Magazine Editors on its contents page. The society was organized just prior to that time.

Up to the present, membership in the society was in the name of the publication and its designated voting editor. Since the first of the year, much study has been given to making this a truly professional organization with membership on an individual basis. This step was taken at a meeting in Washington in June.

Purpose of the society is to foster a wholesome professional spirit among editors of business magazines; to encourage ethical standards of conduct in the practice of business journalism; to exchange ideas for the advancement of the profession; to provide editorial contact with the officials of our federal government, administrative leaders, cabinet members, diplomats of all countries, and leaders in all fields of useful and important human activity; to develop a higher standard of business leadership and economic statesmanship; and to work together on common problems.

I believe that the Society of Business Magazine Editors will help the editors of FOUNDRY and other leading business publications to do a better job for American business and industry.

—o—

A Foundry: The July issue of *Service*, a publication of Cities Service Co., carries an article by Leonard A. Stevens on "The Ancient Art of Founding." The first two paragraphs are as follows:

"The men's faces, darkened by smoke and dust were streaked by sweat. The surrounding atmosphere has the quality of lampblack; the floors, the walls, the roof are dull black. Noise jars everyone and everything. Now the room is lit by a shower of sparks and a stream of molten metal pouring from a large cupola. The hot metal is caught in a heavy pot suspended from an overhead track, and it's sent swinging out into the room. Two men grasp the pot and the metal is poured, a portion at a time, into a row of black boxes.

"This is a foundry. Beneath its blackened features is one of the oldest industrial arts known to man. Its skills are built upon centuries of experience dating back to the pre-Christian era. Practiced today on an immense scale, the founder's art has become basic to nearly every form of modern manufacture."

The article then tells of progress in castings, and describes the use of core oils in making cores for intricate castings. It is well illustrated.

But I wish the author had seen a few of our real modern foundries before writing the lead to his report.

—o—

Pangborn Contest: Foundrymen must be smart. If this was not known before, it was proved by results of the Rotoblast steel shot contest conducted by Pangborn Corp. in conjunction with the introduction of a new vacuum cast steel shot. With more than 6000 correct entries, the officials of the company decided to select the final winner by a drawing. All entry cards gathered at the Foundry Show and coupons from Pangborn advertising were loaded into a new three cubic foot Rotoblast cleaning barrel and thoroughly mixed in a single cleaning cycle. The accompanying illustration shows Winslow F. Burhans, mayor of Hagerstown, who has drawn the winning entry, giving it to Victor F. Stine, president of the company.

And most important, the winner is Wayne C. Keith, development engineer, Aluminum Co. of America, Cleveland, who can now select a Ford Thunderbird, a Chevrolet Corvette, or a Plymouth Fury.

—o—

Foundryways Cited: Another foundry has received a compliment for the excellence of its employee publication. *Foundryways*, published by the Belle City Malleable Iron Co., and Racine Steel Castings Co., Racine, Wis., recently was cited in the annual Wisconsin Industrial Editors Association compe-

Ladle linings last longer with H-W BLACK PATCH

H-W Black Patch is a plastic refractory made with super-duty fire clay and graphite and effective oxidation inhibitor.
H-W
BLACK PATCH
New zip-open carton is more convenient.

Costs are reduced, linings last longer and cleaner metal is assured with Harbison-Walker BLACK PATCH because:

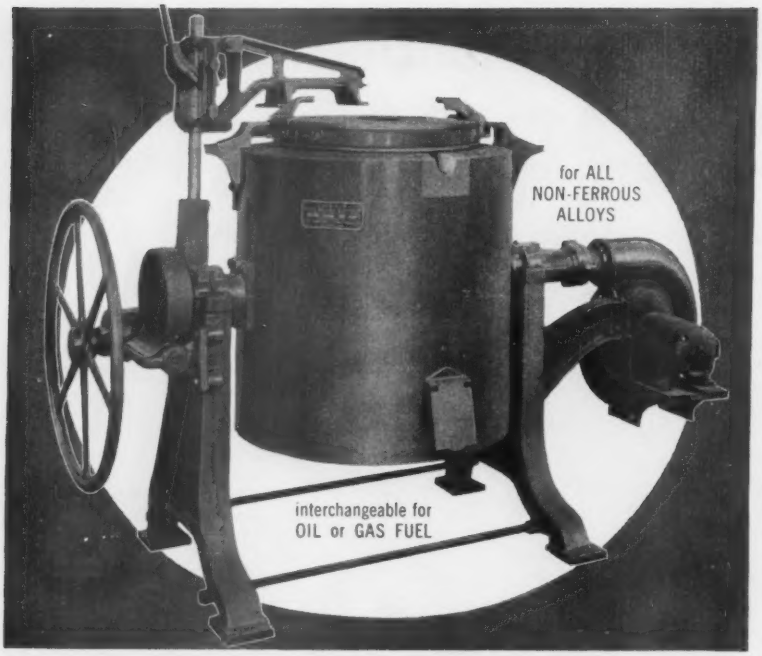
- H-W Black Patch makes a joint-free monolithic lining of very high refractoriness.
- H-W Black Patch develops a strong ceramic set upon heating and is exceedingly resistant to erosion.
- H-W Black Patch is not wetted by molten iron and is not appreciably penetrated by slag and metal.
- H-W Black Patch is highly resistant to thermal shock and oxidation.
- H-W Black Patch is easy to use by air- or hand-ramming to any desired shape.

Other important applications in which H-W BLACK PATCH renders unusual service for cupola requirements are breast walls, tap and slag holes, spouts and runners.

World's Most Complete Refractories Service

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES
General Offices: Pittsburgh 22, Pennsylvania

Circle 562 on Page 119



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- heavy duty cast iron trunnions surrounded by roller bearings
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- exclusive Hausfeld swing-top compensates for various size top covers

With crucible sizes from #40 to #400, there is a Hausfeld Tilting Furnace to help you boost your plant's efficiency. Write for full details today.

THE CAMPBELL-HAUSFELD CO.,
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METAL MELTING FURNACES

tition. A special achievement award was won for journalistic excellence in interpreting the federal highway construction program in terms of how it would affect the Racine foundry and its employees. This award represents the 20th citation for *Foundryways* during its ten years of publication.

Congratulations to Belle City for an excellent publication, and to its editor, Elaine M. Kitto.

—o—

New Alloys: Late in June I attended an editorial seminar staged in Pittsburgh by the Crucible Steel Co. of America. Announcement of the availability of their new heat-treatable titanium alloys, including the first heat-treatable all-Beta titanium alloy to be produced, was the feature of the program. While it developed that these alloys are not of the castable type, I did learn that Crucible experts believe cast titanium alloys do offer a future potential for numerous uses where special properties are an important factor.

—o—

Why?: Several years ago the National Castings Council considered the publication of a booklet for selective distribution which would present facts and figures on the foundry industry. A committee studied the project at considerable length and then recommended it to the council as well worth while and greatly needed. Financing became the stumbling block, so the project was dropped.

The previous study of the National Castings Council was recalled a few days ago when I received from the president of the Rubber Manufacturers Association a copy of a new 16-page booklet with cover on "What Is the Rubber Industry?" Information on the number of plants, employment, research efforts, contributions to national security, and statistics on the rubber industry are included in this attractive and well illustrated booklet.

Here is an industry with a total sales volume of $6.4 billion in 1957 which is able to promote itself with a presentation that should be quite beneficial.

In 1957, the foundry industry produced castings valued at approximately $6 billion.

Why can another industry with about the same sales volume do a merchandising job that seems beyond the reach of castings producers?

I believe the time has come for foundries to find the necessary funds to do these much needed over-all promotion jobs. F.G.S

Circle 563 on Page 119

Circle 564 on Page 119→

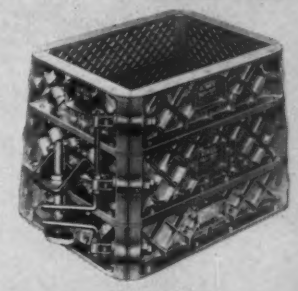
they know HINES... in SOUTH AMERICA, too!

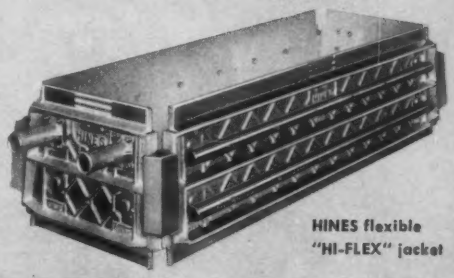
HINES' reputation for highly efficient, dependable flasks, jackets and allied equipment is not confined to foundrymen in this country. For many years now, these fine products have been well known and extensively used throughout the world. In just the past few months, HINES flasks and jackets have been shipped to 12 foreign countries. They have to be good—to go so far!

Shown below is one of the largest export shipments ever made from the HINES plant in Cleveland. Heavy duty, "POP-OFF" flasks and "HI-FLEX" jackets, weighing a total of 132,000 lbs., were forwarded recently to a prominent foundry in Brazil. A second shipment is scheduled to follow soon.

If you've never investigated the advantages of using HINES molding equipment, you're passing up a grand opportunity to lower costs and improve product quality. Why not write for literature or request a HINES representative to call.

HINES heavy duty "POP-OFF" flask





HINES flexible "HI-FLEX" jacket

The

HINES FLASK CO.

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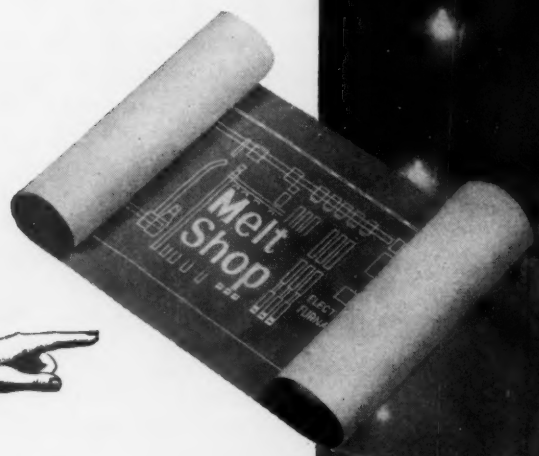
HINES POP-OFF FLASK

Tapping 10-ton Heroult Electric Furnace at the Colton, California, Plant of the Griffin Wheel Company.



Modernization?
Begin it here

The Heroult Electric Furnace will help you produce better-quality steel . . . faster . . . and more economically. Why not put one in now and improve your competitive position with a thoroughly modern melt shop?

The Heroult is a 100% mechanically operated electric furnace. All movements are handled by motor-driven gear mechanism. Your own maintenance man can easily keep this modern electric furnace performing efficiently with minimum service.

1½ to over 200 tons capacity! In addition to making a full range of foundry sizes—from 1½-ton capacity—Heroult Electric Furnaces are also available in large sizes—with capacities in excess of 200 tons. You can select door-charge or top-charge models—with gantry—or swing-top moving roofs. Special induction stirring equipment, duplexing arrangements, and non-ferrous furnaces also can be furnished.

Complete melt shop installation—American Bridge is prepared to furnish an entire new melt shop tailored to your specific requirements. This service includes the design and construction of a modern melt shop building—from the foundation up—and installation of all machinery and equipment necessary for the efficient production of top-quality steel. Our engineers are prepared to discuss your requirements.

This 32-page catalog will help you determine how Heroult Electric Furnaces can improve your operation and enable you to make better-quality steels; tells you when and where an electric furnace is logical; gives types, sizes, capacities and ratings. For your free copy, get in touch with any of the offices listed below or write direct to Pittsburgh.

USS and Heroult are registered trademarks

American Bridge Division of USS United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.
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United States Steel Export Company, New York

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Specifically designed for BENCH WORK and CORE BLOWER use

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NAME TITLE

FOUNDRY

CITY STATE

Calendar of MEETINGS

Sept. 10-11—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 15-19—Instrument Society of America, annual Instrument - Automation Conference and Exhibit, Convention Hall, Philadelphia.

Sept. 19—Malleable Founders' Society, fall semiannual meeting, Hotel Cleveland, Cleveland.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 22-24—Material Handling Institute Inc., joint industry fall meeting, Greenbrier, White Sulphur Springs, W. Va.

Sept. 23-26—Association of Iron & Steel Engineers, 1958 Exposition and Convention, Public Auditorium, Cleveland.

Sept. 29-Oct. 3—Association Technique de Fonderie de Belgique, International Foundry Congress, Brussels and Liege, Belgium.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 13-15—American Gas Association, annual convention, Convention Hall, Atlantic City, N. J.

Oct. 15-16—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 16-17—All-Canadian Foundry Conference, Royal Connaught Hotel, Hamilton, Ont.

Oct. 16-17—Magnesium Association, annual convention, Fort Shelby Hotel, Detroit.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-24—National Safety Council, National Safety Congress and Exposition, Conrad Hilton, Congress, Morrison, and LaSalle Hotels, Chicago.

Oct. 27-30—Metallurgical Society of AIME, fall meeting, Cleveland.

Oct. 27-31—American Society for Metals, National Metals Exposition and Congress, Public Auditorium, Cleveland.

Oct. 29-31—Metal Treating Institute, annual meeting, Hotel Cleveland, Cleveland.

Oct. 30-31—Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 31-Nov. 1 — Northwest Regional Foundry Conference, Multnomah Hotel, Portland, Oreg.

Nov. 10-12—Steel Founders' Society of America, Technical and Operating Conference, Carter Hotel, Cleveland.

Nov. 20-21—National Foundry Association, annual meeting, Drake Hotel, Chicago.

Dec. 3-5—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Steel Conference, Detroit.

1958

Feb. 12-13—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 19-20—Southeastern Regional Foundry Conference, Hotel Tutwiler, Birmingham.

March 11-12—Foundry Educational Foundation, annual College-Industry Conference, Hotel Statler, Cleveland.

March 13-14—California Regional Foundry Conference, Huntington Hotel, Pasadena, Calif.

March 16-17—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

March 16-20—American Society for Metals, plus other technical groups, Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

April 13-17—AFS Castings Congress & Engineered Castings Show, Hotels Sherman and Morrison, Chicago.

May 25-26—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

ANOTHER INDUCTO INSTALLATION...

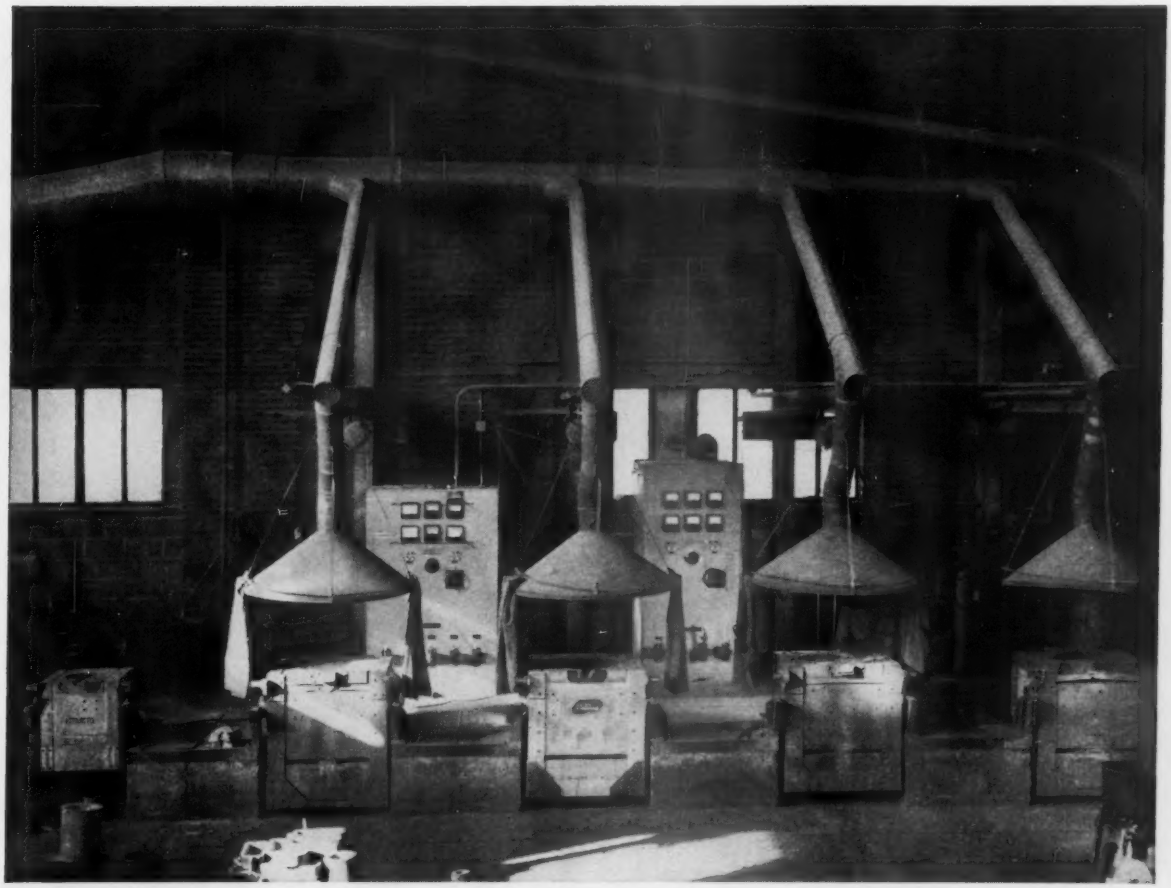


PHOTO COURTESY OF SORENSEN INDUSTRIES.

In Two Years Of Operation At Sorensen Industries, These INDUCTO Furnaces Saved More Than Their Cost

Since Sorensen Industries installed INDUCTO induction furnaces, they have reduced metal losses and minimized rejects. These benefits plus higher melting speeds have saved more than the cost of the furnaces in just two years of operation.

The installation includes four, 1000-pound furnaces which are operated from a 250 kw m-g set. A 50 kw m-g set is interlocked with the main unit so that it can maintain a molten bath in any of the four furnaces at holding temperatures. Four furnaces were used in this installation to eliminate contamination from one alloy to another.

You, too, can benefit from modern INDUCTO metal melting equipment. Want to know more? Write today. INDUCTO engineers will be glad to study your requirements. The Inductotherm Corporation, 412 Illinois Avenue, Delanco, New Jersey.

INDUCTOTHERM corporation

412 Illinois Ave. Delanco, N. J.

Circle 567 on Page 119

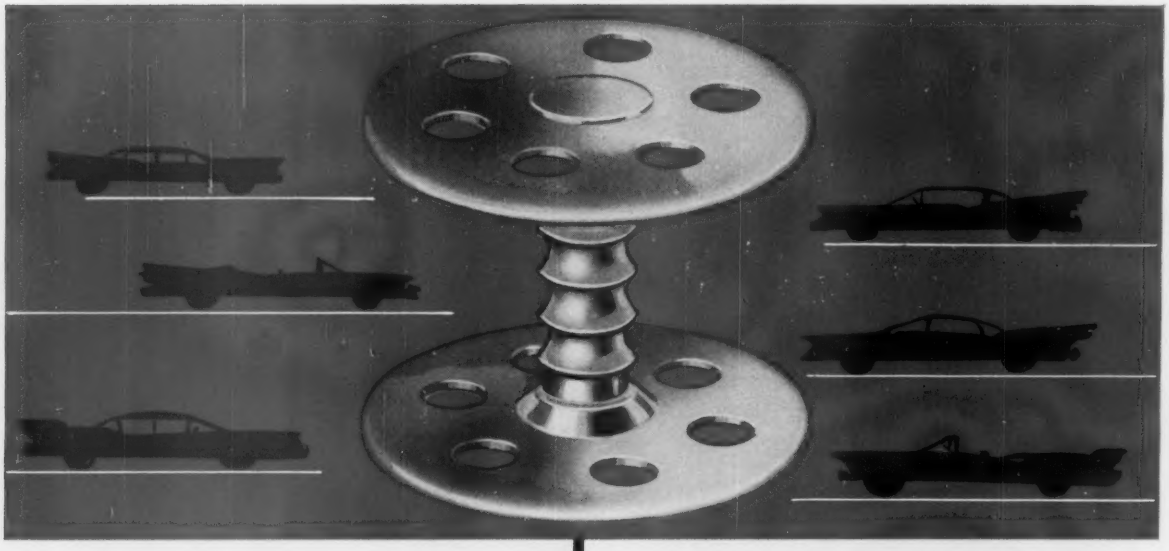
automobile styles may change...

but motor car manufacturers unanimously choose

fine FANNER

DOUBLE HEAD MOTOR CHAPLETS

for producing sound, uniform castings



The tremendous flow of uniform, sound castings necessary to the automotive industry must be maintained with no sacrifice in quality. That's why more Fine FANNER motor chaplets have been used by more producers of automotive castings than all other types combined.

Fine FANNER motor chaplets with their exclusive designs, their positive core support, accuracy of production and their complete fusion help produce better, sounder castings at lower cost.

Prevent costly product failures due to unsound castings by using fine FANNER motor chaplets for all your requirements.

Only a few of the wide range of motor chaplets made by FANNER are shown here — get acquainted with the complete line by writing today for your free copy of the FANNER Chaplet Catalog.

ENGINEERING SERVICE

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

THE FANNER MANUFACTURING COMPANY

designers and manufacturers of fine FANNER CHAPLETS AND CHILLS

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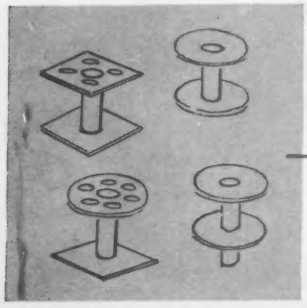
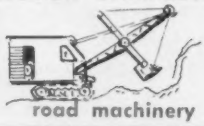
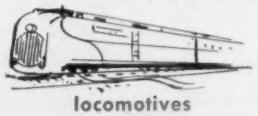


there are fine FANNER MOTOR CHAPLETS for many other products . .

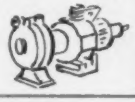


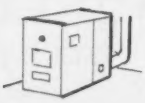
road machinery



locomotives

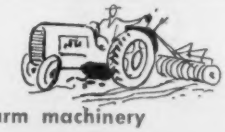
pumps





furnaces

stoves



farm machinery

Circle 568 on Page 119

COBALT 60, CESIUM 137, IRIDIUM 192 . . .

the whole story in a nutshell in Ansco's free new

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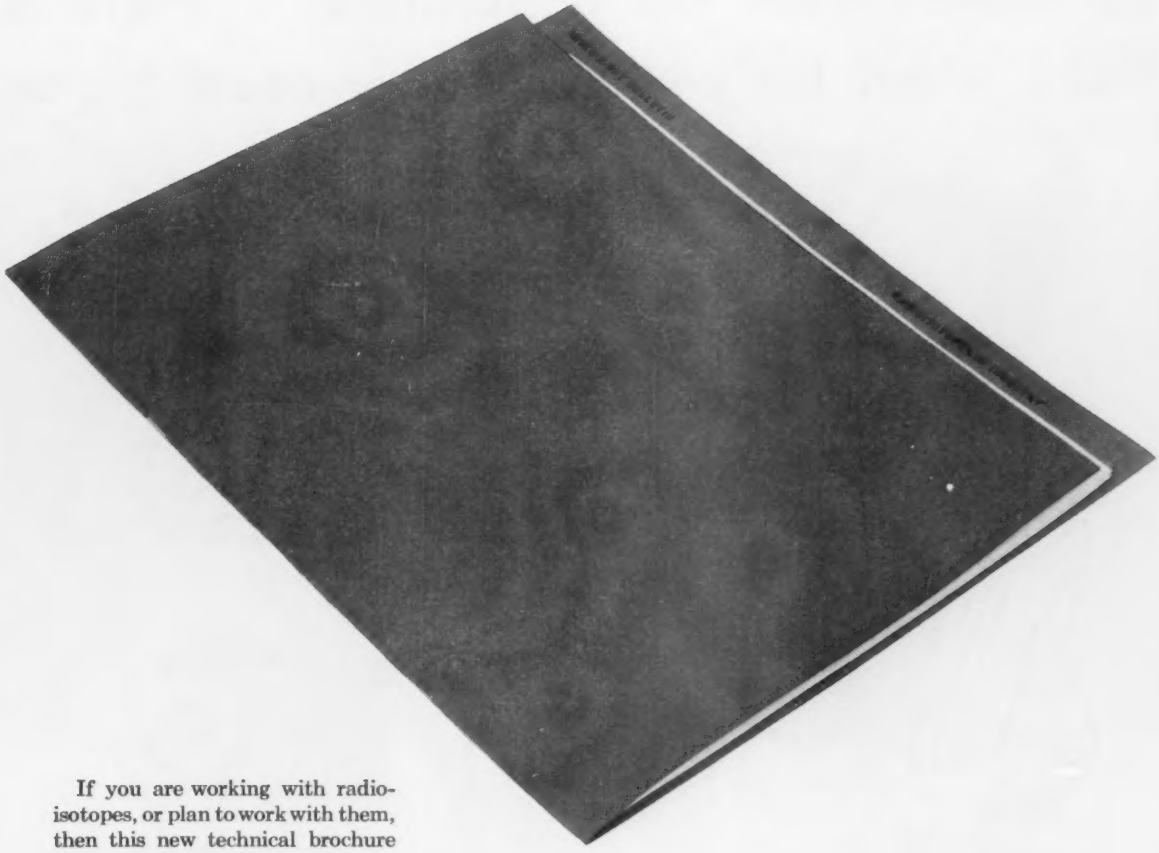

If you are working with radioisotopes, or plan to work with them, then this new technical brochure is a must for your files.

It gives needed facts and figures on the use of major radioisotopes . . . explains in detail half-lifes, intensity, energy . . . and, describes how each of these characteristics affect exposure time and radiographic quality. It also presents basic exposure factors and compares the quality of radiographs made by exposure to x-rays and gamma rays.

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Gentlemen: Please send me a copy of "Radioisotopes In Industry". I am actively engaged in industrial X-ray work.

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no matter what the application . . . there is Mold Wash for every foundry need . . . or

SIPAC®

with only the addition of water, produces a bright, gold-colored coating with fine, smooth surfaces, using any foundry sand. It's non-carbonaceous and inert and will not react with any molten metal, including grey iron and steel. Resists flaking and completely protects core surfaces. You get improved casting quality. Sipac is available in 55 gallon drums, ready for mixing and dilution to desired Baume — even to a scale of 32 — without settling.

MEXICAN® VV FLAKE ("volatile vehicle") — meets the growing demand for good mold and core wash suited to carbon dioxide mold-core hardening process. Completely compatible with isopropyl alcohol, oleum spirits, kerosene or similar agents, Mexican VV Flake provides extra refractory protection . . . improves skin hardness . . . gives better casting quality. Comes in paste form, suitable for application by spraying or dipping.

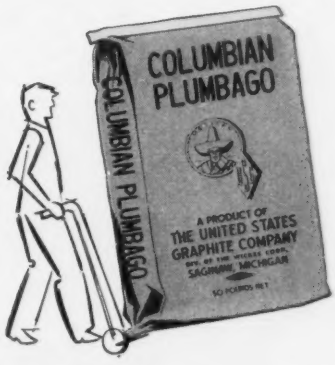
MEXADIP® — refractory core coating containing its own binder, requires only water to prepare it for use. Will not ferment, produces a very uniform, even coating over entire core with practically no sagging, running or dripping. Use it throughout foundry for green or baked cores, ferrous or nonferrous foundry practice.

THE UNITED STATES

GRAPHITAR® CARBON-GRAPHITE • **GRAMIX®** POWDERED METAL PARTS • **MEXICAN®** GRAPHITE PRODUCTS • **USG®** BRUSHES

HES · WASHES

a United States Graphite Company Core or one may be engineered to your requirement



MEXICAN® COLUMBIAN PLUMBAGO— versatile wet blacking used for loam work, green or dry sand or torch dried molds where soft coat with high resistance is required. Suitable for all types of castings, including those of over 25 tons, high steel mixtures and castings poured at high temperatures.

SLICK RITE® — compounded from a base of high quality flake graphite to produce best slicking qualities, Slick Rite is applied to green sand molds by hand rubbing, tooling or brushing. Excellent casting quality obtained when mixed with water and molasses to produce wet lead for spraying molds and cores.

MEXICAN® 172—high refractory wet blacking with binder. For application to both molds and cores of heavy sectioned castings where best possible finish is required under severe pouring conditions.

No. 866® —is a wet blacking without binder. Provides soft coating with good refractory properties for molds and cores of medium and light sectioned castings. Also makes good blacking for bell end cores in pressure pipe manufacture. Can be applied by spraying, brushing or swabbing at 40-45 Baume.

MEXICAN® 700 — is particularly suitable for large molds and dry sand cores of high carbon iron such as cast iron rolls and ingot mold castings poured at intermediate temperatures. Contains no binder.

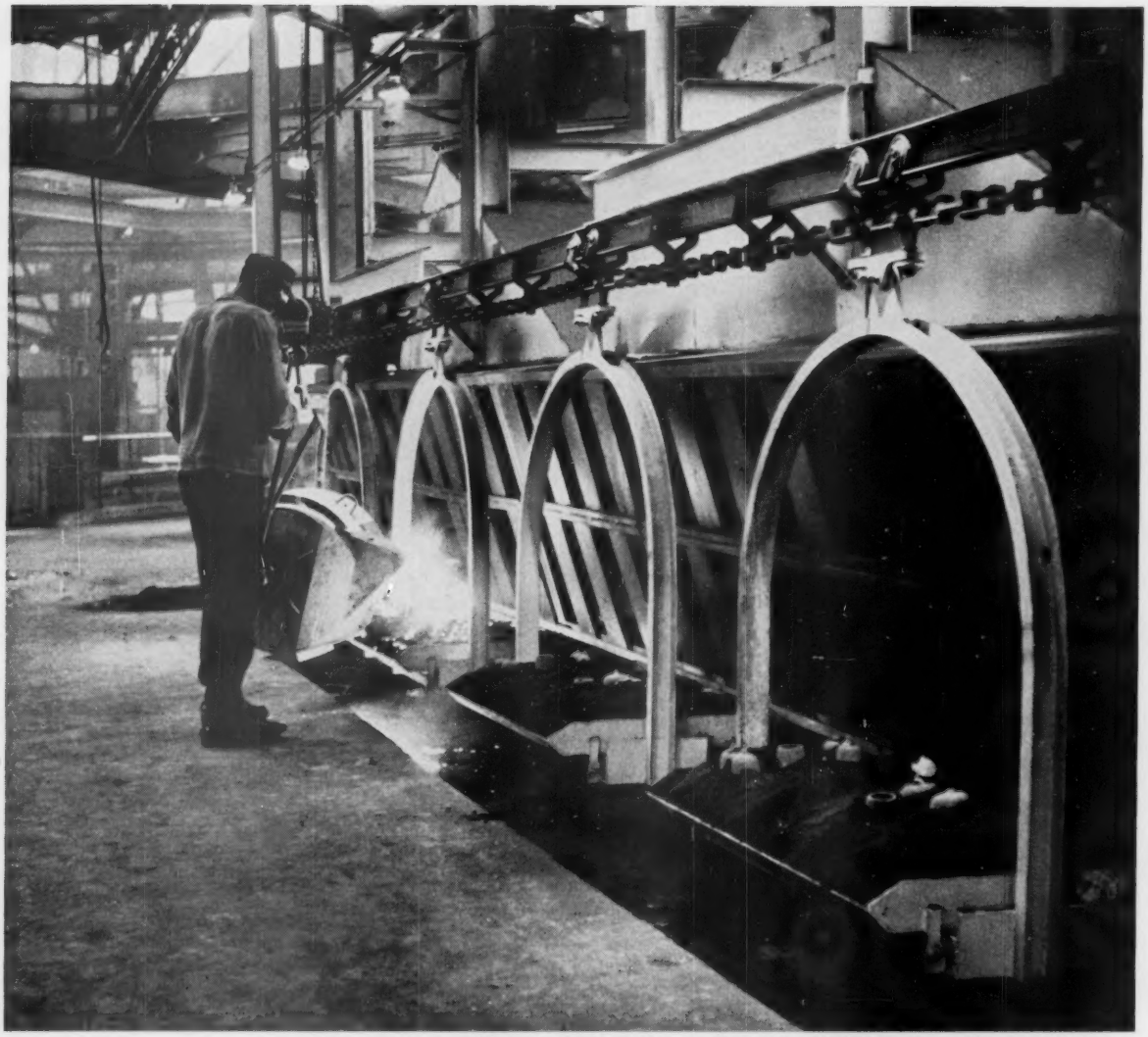
Write today for engineering bulletin No. 17 giving complete details and application methods of core and mold washes for all ferrous and nonferrous foundries.

GF-244-2

GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

Circle 570 on Page 119



Castings that need less finishing are poured in Durez-bonded shell molds at Albion Malleable Iron Co.

Foundry keeps customers sold with shell-molded castings

More than 200 times every hour, another shell mold moves into the pouring line at Albion Malleable Iron Co., Albion, Mich. Metal pours into the still-hot shell—and another casting goes on its way to a satisfied customer.

Satisfied—because these shell-molded castings need less finishing than sand castings. Their dimensions are more uniform. Surfaces are smoother; details are sharper.

These advantages add up to good business for Albion. They'll add up to good business for *your* foundry, too.

Shell molding with Durez foundry resins is the way to get them. Like many other progressive foundries, Albion uses Durez resins 100%!

Your Durez technical man can help you plan and carry out a conversion to shell. He's foundry-trained; backed by 37 years of resin experience and research. Call him in soon.

For up-to-the-minute facts on shell molding for your foundry, send for the new 32-page "Durez Guide to Shell Molding." It's revised, fully illustrated; covers patterns, materials, mixing, temperatures, lubricants, molds, cores. Write for it today.

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION
HOOKER CHEMICAL CORPORATION
1009 Walck Road, North Tonawanda, N. Y.

Circle 571 on Page 119

Why Grandmother!

Stories on cleaning room problems—just like the kind you tell the youngsters—can have a happy ending. And we're writing new ones day after day for foundries where high snagging costs and low production have been wolfing up profits.

If *you* are ready to "cry wolf," let us send CINCINNATI (PD)° SNAGGING WHEELS to the rescue. Customers report that the fast, easy cutting action of CINCINNATI (PD) SNAGGING WHEELS really cuts snagging time . . . and thus saves money.

Our customers report, too, that POSITIVE DUPLICATION (PD) means *another* savings. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *And these better, cost-cutting* (PD) WHEELS *are priced no higher than ordinary wheels.*

So, if grinding problems have you ready to shout for help, contact your CINCINNATI Grinding Wheels distributor. Or, contact us direct. Write, wire, or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI° *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U. S. Pat. Off.

Circle 572 on Page 119

ON-THE-JOB PROTECTION for employee valuables and personal belongings is being provided by Republic Steel Lockers in industrial plants everywhere. They combine smart styling and design with simple construction for fast, easy installation. Republic Steel Lockers provide full inside-locker roominess, sanitation, safety. Bonderized finish is locked on . . . rust is locked out. Republic's Berger Division offers complete planning and installation service. Send coupon for full facts.

Versatile Chateaugay Pig Iron is specified for both castings shown at left. The producer, The Union Metal Manufacturing Company, Canton, Ohio, has found over the years that there is no better nor more economical means for producing consistently top-quality castings or for meeting their customers' strict requirements.

The flywheel is cast in sizes up to 36 inches in diameter. It is used in both stationary and automotive engines. Casting requirements call for a high degree of machinability since one surface serves as a clutch face, plus excellent density to resist the effects of turning at a very high rpm.

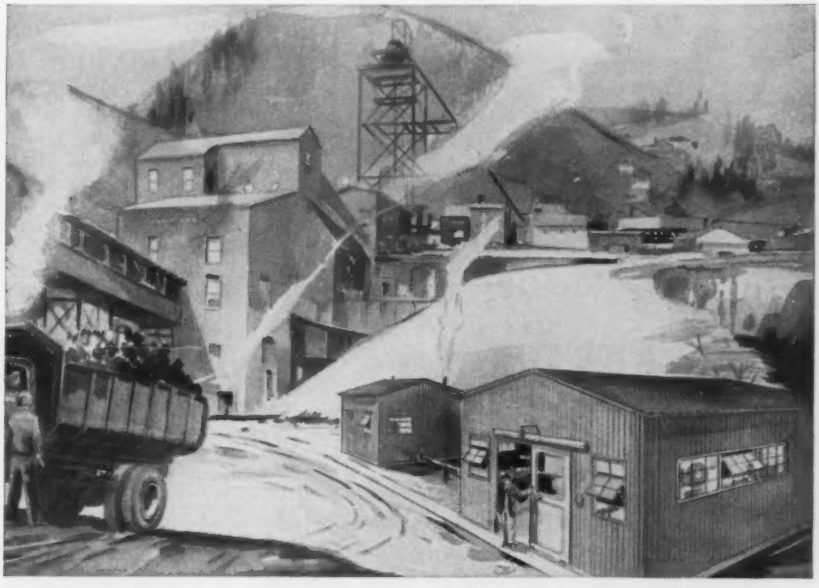
The melting pot, used by a large appliance manufacturer in melting aluminum, requires high heat-resistance and maximum density.

Chateaugay's uniform distribution of chemical elements produces a dense grain structure which results in economical machining—plus excellent wear-resistance. Other characteristics of Chateaugay are unequalled by any domestic pig iron, and its high carbon and unusually low sulphur, phosphorus, and manganese contents make it ideally suited for production of ductile cast iron.

A Republic Pig Iron Metallurgist will give you all the facts about Chateaugay and other Republic Irons. As the only producer of both Northern and Southern Iron, Republic offers industry's most complete line of merchant pig irons. Northern grades include Malleable, Bessemer, Foundry and Basic. Southern furnaces produce Foundry and Basic Irons.

The coupon will bring you prompt, expert metallurgical service and more information on Republic's complete line of irons.

ADDITIONAL SPACE REQUIREMENTS are met economically with Truscon's new line of "Budget Buildings". They are strong, lightweight, flexible — can be erected quickly at foundry, mill, factory, and field locations. No painting needed. Widths, 32 to 48 feet (in 4′ 0″ increments) . . . heights, 12 and 14 feet . . . lengths as long as you want them. Send coupon today for complete facts.



REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. FO-5279A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

☐ Have a Pig Iron Metallurgist call.

Send more information on:
☐ Chateaugay ☐ Northern Pig Irons ☐ Lockers
☐ Truscon "Budget Buildings ☐ Southern Pig Irons

Name_____ Title_____

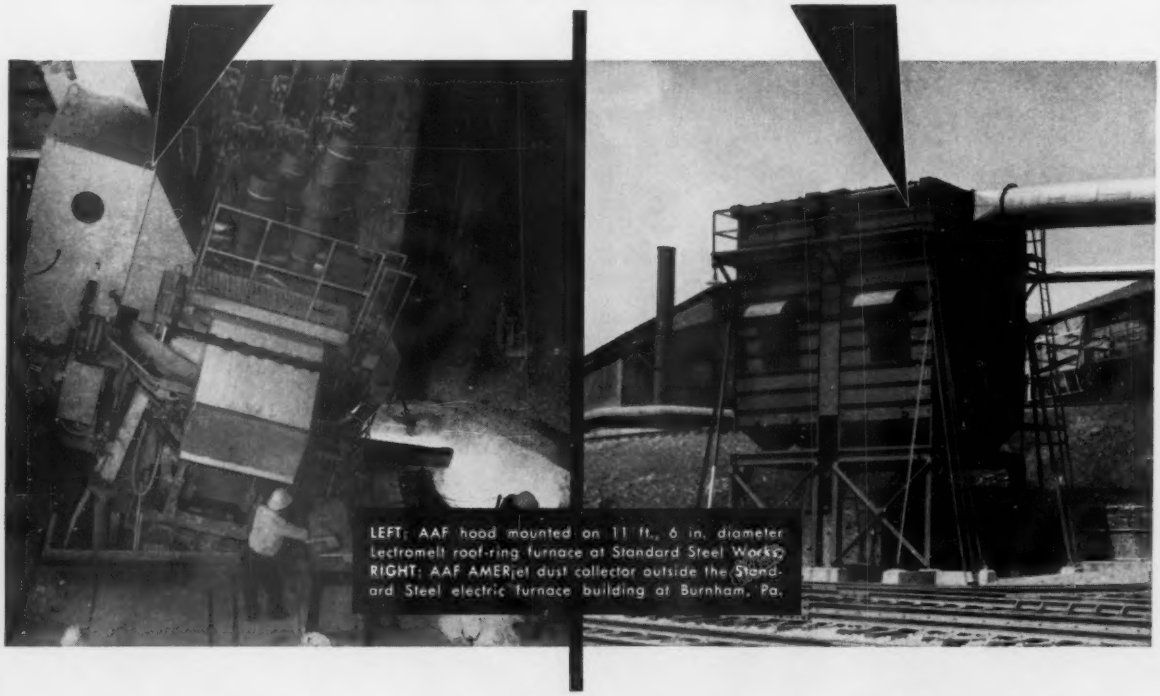
Company_____

Address_____

City_____ Zone____ State_____

Circle 573 on Page 119

ELECTRIC FURNACE FUMES CONFINED and COLLECTED...



LEFT: AAF hood mounted on 11 ft., 6 in. diameter Lectromelt roof-ring furnace at Standard Steel Works. RIGHT: AAF AMERjet dust collector outside the Standard Steel electric furnace building at Burnham, Pa.

...by AAF Furnace Hood and AMERjet team!

Winter's "closed shop" gives free rein to the hazards of fumes from electric melting furnace operations. Lowered visibility, morale and efficiency are the inevitable result. Solution? AAF's *proven* foundry combination of Furnace Hood and AMERjet Fabric Dust Arrester.

The AAF Furnace Hood (now in one of every three steel foundries in the nation) confines air impurities at the source, permitting complete foundry ventilation with minimum air requirements and power consumption. The AAF AMERjet is today's most modern reverse jet-type fabric dust collector. The AMERjet is characterized by high collection efficiency, special ability to handle gases with fine particles, constant exhaust volume, maintained performance over a wide range of operating conditions, and small space requirements.

Get full details on the AAF Furnace Hood-AMERjet from your local American Air Filter representative, or write us direct.

AAF herman nelson

American Air Filter
COMPANY, INC.

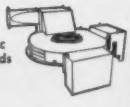
266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Herman Nelson Portable Heaters

Illinois Heating Specialties

BETTER AIR IS OUR BUSINESS

AAF Electric Furnace Hoods



AAF Type K Exhauster

Charging some of the first T-ingots to arrive in the U.S. Photographed at an independent aluminum fabricator—the Kawneer Company, St. Charles, Illinois

To aluminum fabricators...

who value the importance of ingot design

As specialists in the production of high-quality aluminum ingot in almost every shape and form, Aluminium Limited research is constantly seeking ways to improve its ingot products to serve its customers better. Whether your ingot problem is a question of shape . . . dimensional tolerances . . . or alloy composition control, Aluminium Limited's engineers have the know-how to help meet your ingot fabricating or aluminum remelt requirements.

The T-ingot design is one of several recent developments that have brought savings to many customers in the U.S. Available in 750- and 1500-pound sizes, and shaped like a flattened T, these ingots have been specially tailored to speed handling by fork-lift trucks . . . have successfully reduced railcar unloading time up to 50%. Precision formed, T-ingots stack compactly, up to 10 high, with greatly improved stability. For information about the T-ingot or aluminum in any other ingot form, call or write the nearest office of Aluminium Limited Sales, Inc.

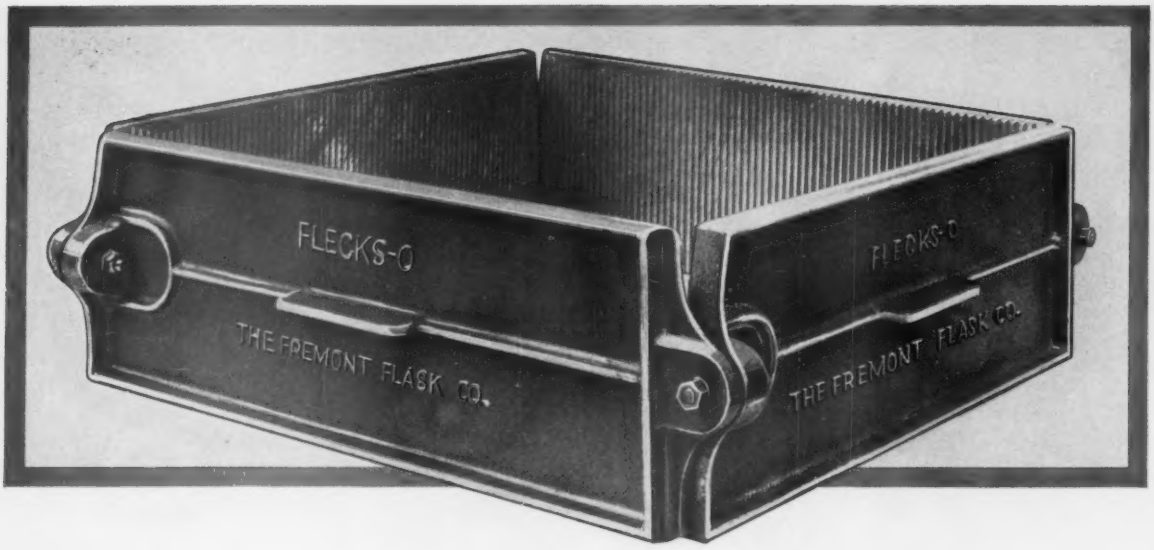
Aluminium Limited

*Ingot Specialist...*serving
American Aluminum Fabricators

In the U. S.—Aluminium Limited Sales, Inc.
630 Fifth Avenue, New York 20, N. Y.
CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA

Additional distribution (Alcan Foundry Alloys):
Apex Smelting Company, Chicago, Cleveland, Los Angeles
Charles Batchelder & Company, Botsford, Conn.

Circle 575 on Page 119



Fremont's

"FLECKS-O" Jacket

This new flexible JACKET has been developed to eliminate shifts and runouts.

The "FLECKS-O" will automatically line up with the sides of molds made in flasks assembled on any of the standard tapers. These JACKETS are available either in cast iron or cast aluminum.

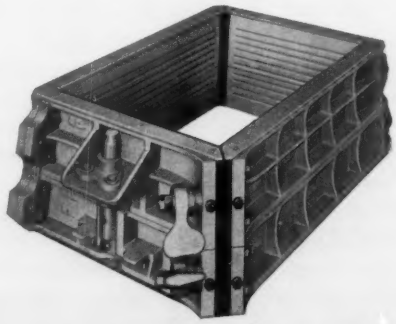
The "FLECKS-O" is assembled from 4 castings, so if you have the misfortune to break one of them, you need not scrap the entire JACKET. Completely machined and drilled replacement castings can be furnished at a nominal cost. These can be installed simply by removing 2 nuts.

THE FREMONT "FLECKS-O" JACKET IS AVAILABLE IN STANDARD 4½", 6", 7½", 9" AND 10" DEPTHS. WRITE US FOR PRICES.

Fremont's

SPREADLOCK FLASKS

have tremendous corner strength. They are made of magnesium, with cams of hardened steel forgings. Accurately machined to assure exacting work.



THE FREMONT FLASK CO.

FREMONT, OHIO

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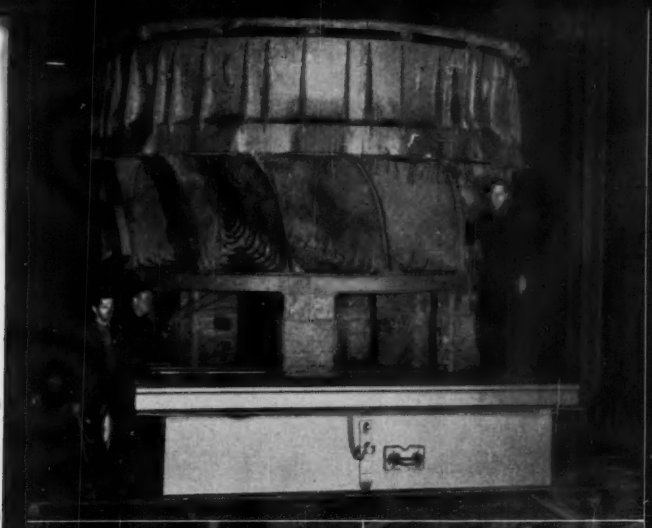
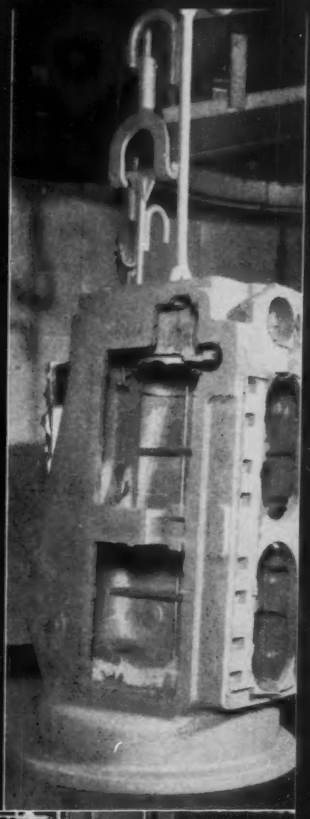
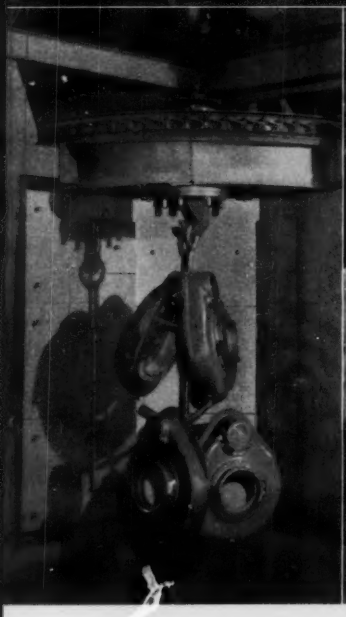
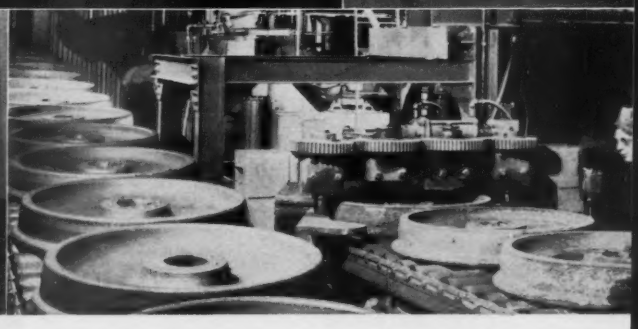


WHERE DO NEW IDEAS COME FROM?







Production problems turned to profits by Wheelabrator® inventiveness

Introduction of the revolutionary airless Wheelabrator ® quickly obsoleted many long-established concepts of foundry blast cleaning methods, and cleaning costs.

And through the intervening years, Wheelabrator creative engineering has continued to lead the way. The benefits of the Wheelabrator process have been extended to many complex production problems in a variety of industries.

The cleaning of large, bulky castings is typical of such problems solved by Wheelabrator inventiveness. The Wheelabrator cleans castings weighing up to 100 tons each, doing in minutes what formerly was a laborious, time-consuming airblast job.

From this inventiveness has come years of diverse experience, unequalled in the field of airless blast cleaning. And with it, the sure knowledge held only by the pioneer who first tried and succeeded. Here is ample testimony to the performance of Wheelabrator equipment, and to the regard of industry for Wheelabrator's fifty years of service through pioneering leadership.

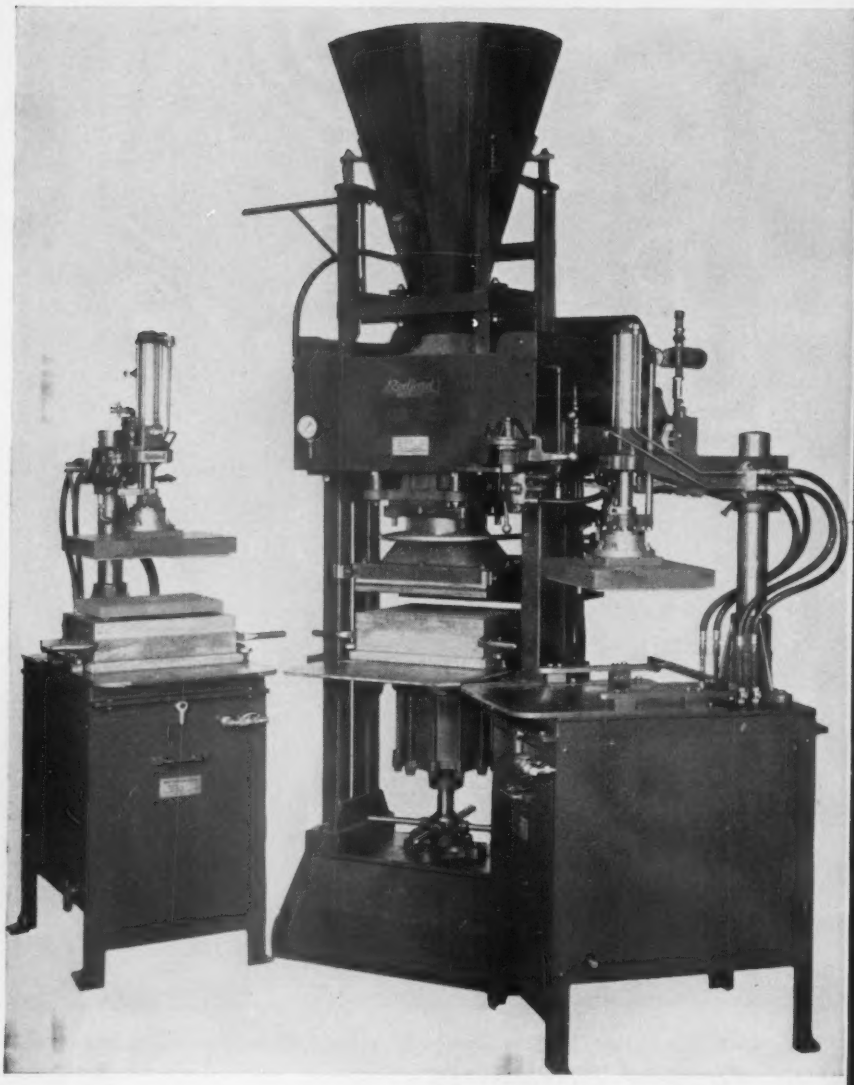
WHEELABRATOR
CORPORATION

World's largest manufacturers of airless blast equipment and steel abrasives.

50 YEARS OF PROGRESS
WHERE PIONEERING LEADERSHIP INSURES PERFORMANCE

505 South Byrkit Street Mishawaka, Indiana • Canadian Offices: Scarborough (Toronto)—Montreal

Circle 577 on Page 119



REDFORD CO_2 MOLD MAKING EQUIPMENT

Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

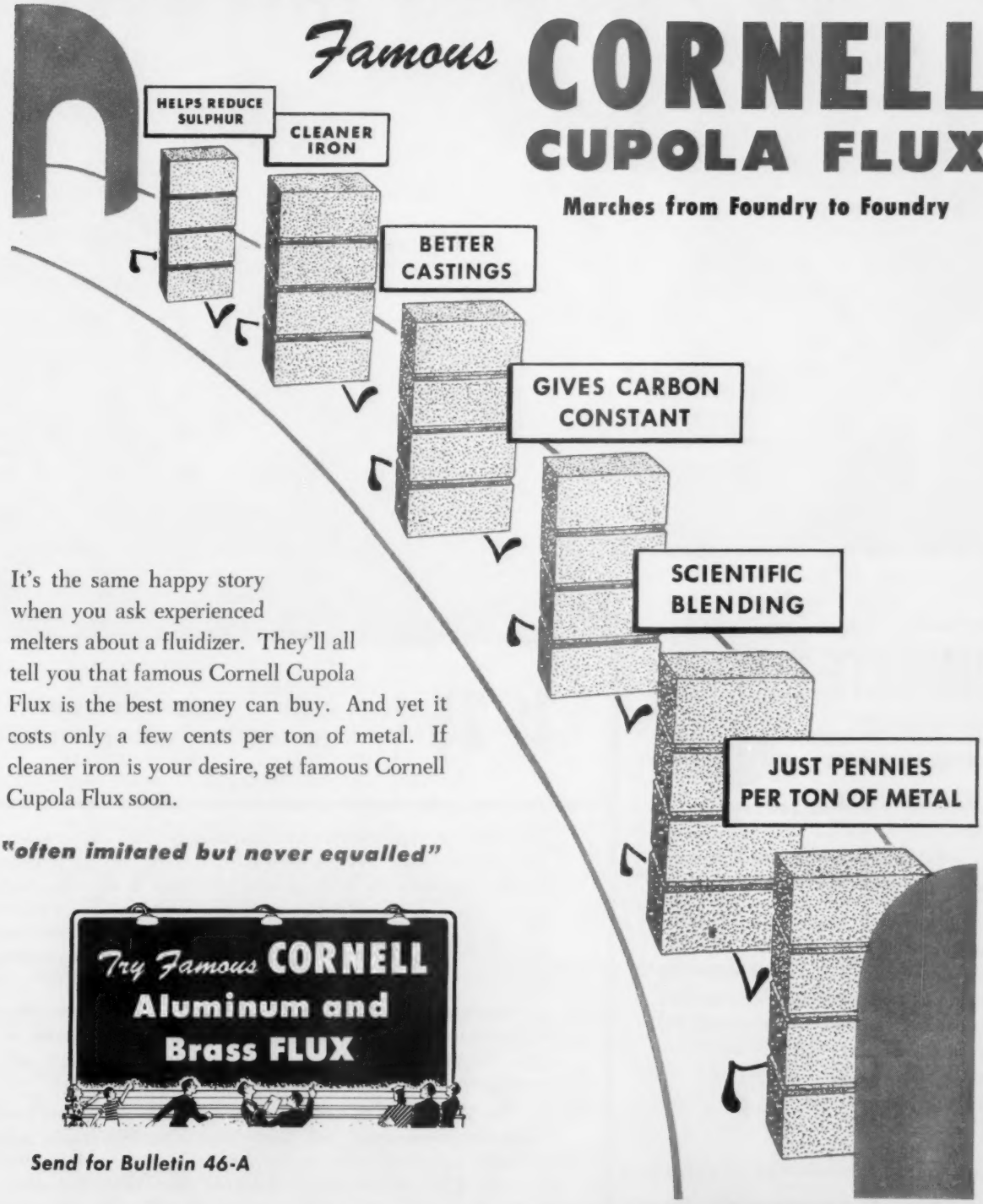
Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

Circle 573 on Page 119

the success of...

Famous CORNELL CUPOLA FLUX

Marches from Foundry to Foundry



It's the same happy story when you ask experienced melters about a fluidizer. They'll all tell you that famous Cornell Cupola Flux is the best money can buy. And yet it costs only a few cents per ton of metal. If cleaner iron is your desire, get famous Cornell Cupola Flux soon.

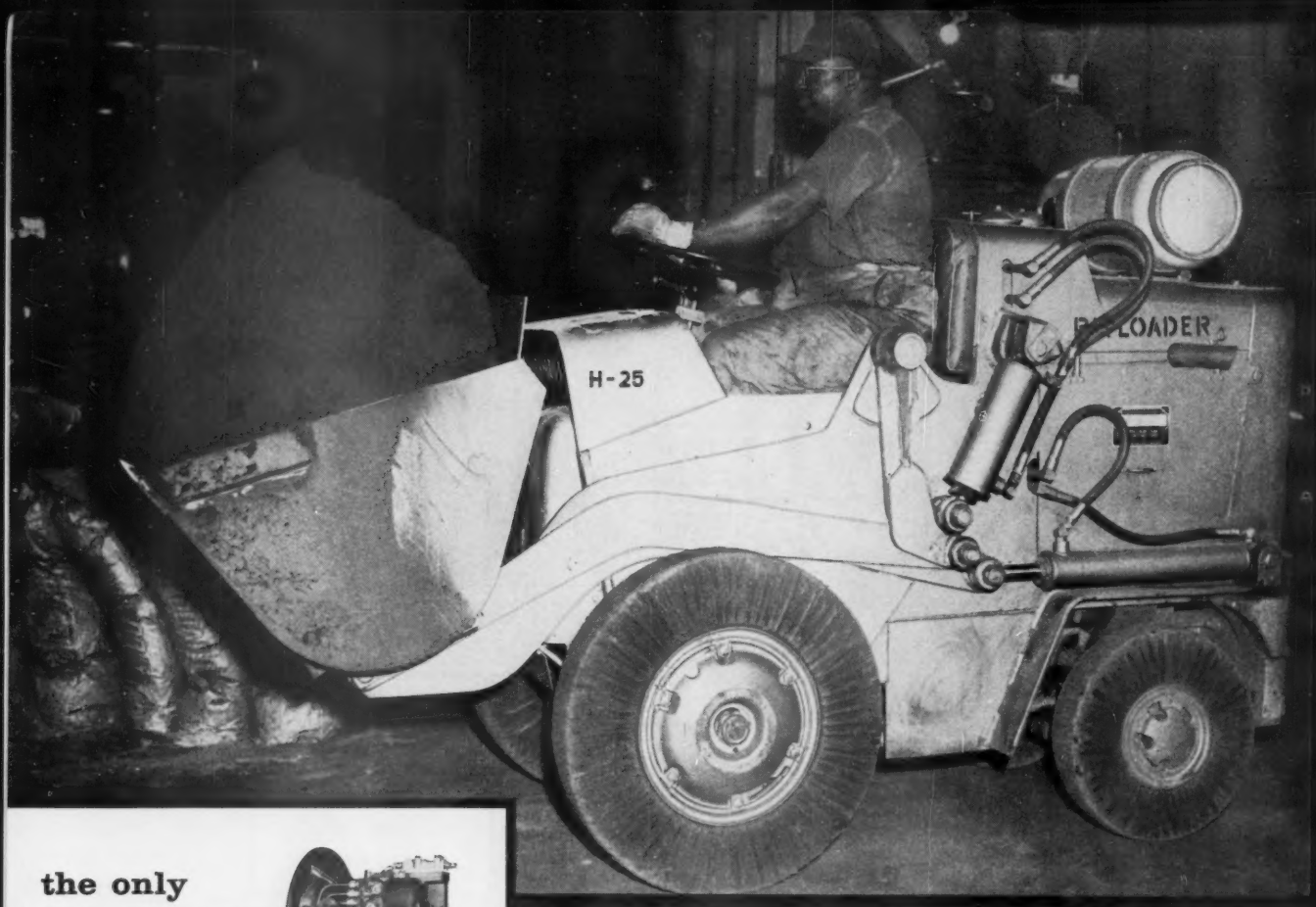
"often imitated but never equalled"

Send for Bulletin 46-A

The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Circle 579 on Page 119



H-25 { ...geared for penetration ...geared for transportation

This new "PAYLOADER" has more hustle than you've ever seen in a tractor-shovel. It's got everything to turn out big production all day long with the least operator effort and is the only machine in its class with *complete* power-shift transmission and power-steer. The carry capacity of 2,500 lbs. is 25% greater than has ever before been available in a tractor-shovel of its size and maneuverability, yet it easily goes in and out of boxcars with narrow 6-foot doors.

Another valuable and exclusive feature is the power-transfer differential that makes traction more effective and reliable at all times because the wheel with the better grip automatically gets the most power.

The H-25 is *full* of other plus features that mean more production, less maintenance and longer life: closed hydraulic system, wet-sleeve overhead valve engine, triple air cleaners, full-shift fuel capacity, 4,500 lbs. of bucket breakout force and 40° bucket tip-back, to mention only a few.

Your Hough Distributor wants to show you how the greater capacity, speed and handling ease of the H-25 can cut your bulk-handling costs. Ask him about Hough Purchase and Lease Plans too.

Modern Materials Handling Equipment

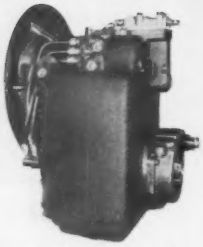
THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Circle 580 on Page 119

the only COMPLETE power-shift transmission



...having two speed ranges forward and two in reverse — the low range for digging power and close maneuvering—the high range for fast, economical travel in either direction.

All shifting, forward or reverse, is an instant finger-tip action with no need to stop between range shifts. The torque-converter is carefully matched with the transmission and is the more costly and more efficient two-phase type that automatically becomes a thrifty fluid drive when torque multiplication is not needed. Transmission and converter also keep comfortably cool because their oil is radiator-cooled.

THE FRANK G. HOUGH CO.

703 Sunnyside Ave., Libertyville, Ill.

Send full data on the H-25 PAYLOADER.

Name.....

Title.....

Company.....

Street.....

City.....State.....

9-A-2

Late News

RECOVERY: Business shows definite signs of improvement but there will be no sustained rise in sales and profits before the turn of the year. This is the consensus of about 200 industrial companies queried by the National Industrial Conference Board. Most optimism was shown by companies outside the metalworking industry. Five of nine iron and steel foundries among the respondents expect no change in second-half orders compared with the first half, three expect more orders, and the ninth anticipates a slight drop.

CONFIRM UPTURN: Purchasing executives also indicate the recovery is proceeding slowly, with no great upturn anticipated immediately, according to the August report of the National Association of Purchasing Agents' business survey committee. More members—45 per cent—reported improvement in production and new orders than at any time since the summer of 1955. No change was noted by 41 per cent and a drop by 11 per cent. Employment continues to gain slightly, and the downward trend in commodity prices is reported to have halted abruptly.

NEW TUNE: Look for auto makers to introduce quality and fuel economy into their sales pitch on new models. Both items are big factors in zooming sales of imported cars, but they have been submerged at Detroit for some time by heavy emphasis on the flashy look. Chrysler has a newly created quality control office, and Ford recently opened a new quality control center. The latter is a small-scale assembly plant with a capacity of five cars a day which is intended to uncover bugs before large-scale production starts.

AIRBORNE STEEL CASTINGS: Steel castings for airframes will offer at least a $1/4 billion market annually, according to L. H. McCreery, supervisor, engineering structures materials, Chance Vought Aircraft Inc., Dallas. This market will develop, he says, as soon as airframe manufacturers are convinced that reliable steel castings are available. Future designs will call for extremely complex structural fittings with maximum strength. Mr. McCreery says that they are not suitable for forging and are costly to machine. High integrity, close tolerance steel castings heat treated to strength levels of 180,000 psi or more are expected to do the job without requiring excessive machining. Chance Vought already is using such castings and reports great savings.

ALUMINUM ENGINE: Talk about the development of aluminum engine blocks continues to circulate in Detroit, where there is much discussion of the design and production problems such blocks would present. Some impetus probably has been given to this talk by the successful production of a V-4 diecast aluminum block with cast iron cylinder sleeves at Johnson Motors Div., Outboard Marine Corp., Waukegan, Ill. One report also has it that Chrysler Corp. has a 6-cylinder diecast aluminum block on the drawing boards, presumably for a small car.

PRICES: Low-phosphorus pig iron has been reduced $1 a ton to $73, Troy, N. Y., by Republic Steel Corp. Primary aluminum prices have been increased 0.7 cent a pound to 24.7 cents for basic pig. Last price change was a 2-cent cut to 24 cents in April.

FOUNDRY CLOSINGS: Plant and 12 acres of land of McCarthy Foundry Co., Chicago, which ceased operations the end of May, have been sold to the Accurate Industrial District, Chicago. M. H. Detrick Co., Chicago, has closed its Newark, N. J., gray iron foundry division. The property is expected to be sold.

PERSONALS: W. Edward Masencup Jr. has been appointed assistant general manager, Lynchburg Foundry Co., Lynchburg, Va. He formerly was manager of standards. William S. Williams has been named to succeed him in that post . . . Paul G. Jacka has been appointed general manager of Herman Pneumatic Machine Co., Pittsburgh . . . Garnet P. Phillips has been made foundry research con-

sultant, manufacturing research, International Harvester Co., Chicago . . . Thomas W. Teetor has resigned as general superintendent, Federal Malleable Co., Milwaukee, to enter the graduate school at Purdue University . . . McConway & Torley Corp., Pittsburgh steel foundry, has appointed August A. Rossetti vice president-operations and Maurice E. Costello assistant vice president-sales . . . Addison Maupin has been named sales manager of Chas. Taylor Sons Co., subsidiary of National Lead Co., Cincinnati.

GRAY IRON AWARD: An annual award has been established by the Gray Iron Division, American Foundrymen's Society, for the best technical paper presented on the division's program at the national AFS meeting. The first award will be made next April at Chicago. Selection of the winning paper will be made by the division's program and papers committee.

ALUMINUM: Production of primary aluminum rose to 118,811 tons in July, compared with 115,325 tons in June, the Aluminum Association reports. Output a year ago was 142,041 tons. The 881,372 tons produced the first seven months was about 9 per cent less than in the 1957 period.

CITY PATTERN SOLD: City Pattern, Foundry & Machine Co., Detroit, has been sold and the new company is known as City Pattern, Foundry & Machine Co. Inc. B. H. Fischer is president and Vaughan C. Reid is vice president. No changes in products or operating methods are planned.

MISCELLANY: Ohio Steel Foundry Co., Lima, Ohio, has ordered a vacuum stream degassing system with a capacity of 70 tons from F. J. Stokes Corp., Philadelphia . . . Mexico Refractories Co., Mexico, Mo., plans construction of a complete new $2 million plant near Stockton, Calif. . . . Kaiser Aluminum says the average 1959 model car will use 57.1 pounds of aluminum, compared with 50 pounds in 1958 and 46.3 pounds in 1957 . . .Westinghouse Electric Corp. has sold its Industrial Furnace Div., Meadville, Pa., to Sunbeam Corp., Chicago . . . Pyle-National Co., Chicago, is acquiring Stever Mfg. Co., Broadview, Ill. . . . Olin Mathieson Chemical Corp. has formed an international company with four foreign firms to develop French West African bauxite.

Prices of Foundry Metals and Coke

(As of Aug. 25, 1958)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$28.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.00; tin bronze, No. 225, 36.00; No. 245, 30.75; High-leaded tin bronze, No. 305, 31.25; No. 1 yellow, No. 405, 22.75; manganese bronze, No. 421, 24.50.

ALUMINUM: 99 per cent plus primary ingots 26.80. Secondary No. 12 alloy, 21.75. Deoxidizing grades: No. 1, 22.75; No. 4, 17.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 26.50, delivered Connecticut valley.

ZINC: High grade 11.00, delivered. Die casting alloy No. 3, 12.25; No. 2, 12.75, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$35.00-36.00*	$54.00-55.00	.....	.....	.....	.....	$51.00-52.00
Boston*	**25.00	**30.00	.....	.....	**36.00-38.00	.....	.....
Buffalo	34.00-35.00	**38.00-39.00	.....	.....	**42.00-43.00	.....	59.00-60.00
Chicago	44.00-45.00	45.00-46.00	.....	51.00-52.00	51.00-52.00	57.00-58.00	60.00-62.00
Cincinnati*	**38.50-39.50	**42.00-43.00	**34.00-35.00	.....	**46.00-47.00	.....	**53.00-54.00
Cleveland	39.50-40.50	44.00-45.00	36.00-37.00	49.00-50.00	49.00-50.00	60.00-61.00	57.00-59.00
Detroit*	**34.00-35.00	**38.00-39.00	**28.00-29.00	**40.00-41.00	.....	.....	.....
Los Angeles	32.00	**41.00	.....	.....	.....	.....	.....
New York*	32.00-33.00	35.00-36.00	33.00-34.00	.....	.....	.....	.....
Philadelphia	38.00	40.00	42.00	.....	48.00-50.00	58.00-59.00	57.00-58.00
Pittsburgh	42.00-43.00	43.00-44.00	.....	39.00-40.00	51.00-52.00	.....	57.00-59.00
St. Louis*	39.00	48.00	39.00	48.00	.....	.....	52.00
San Francisco	32.00	42.00	28.00	40.00	40.00	.....	.....
Seattle	30.00	31.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

DO IT YOURSELF

WHITEHEAD'S

X-TRUDE-A-SEAL

Costs less than any packaged preformed strips

Stoller Chemical Co.'s X-TRUDER extrudes up to 45 ft. of seal strip per minute!

YOU'RE ON THE TARGET when you do it the X-Trude-A-Seal way! —

- Make your strips daily as you need them
- Re-extrude all leftovers the next day to desired sizes
- Sizes from ¼" to ¾" diameter

- Will not dry out or crack
- Economical — eliminates waste of material
- Applies faster than preformed extruded strips
- Reduces chipping, grinding, porous metal, leakers
- Eliminates uneven casting walls, excessive fins

Of course, Joint Seal is available for hand rolling, hand gun, or use with Stoller X-Truder

***FIND OUT HOW MUCH YOU CAN SAVE** — contact your distributor . . . or write direct*

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence, R. I. 1

Manufacturers of

LYQUAGRIP
Ready-to-use core paste

DUO RESIN
Binder for baking with controlled oven temperatures

JOINT SEAL
Plastic compound for perfect sealing

LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

Circle 581 on Page 119

How Dave Beach's competitive analysis

Purchasing Director Dave Beach (left) and Bay State distributor Sherwin Haskell (right) discuss chart showing test results.

When a *supplier* thinks up ways to make a product test more rigid, you've really got something.

That's what happened when David D. Beach, Purchasing Director for Malleable Iron Fittings Co., Branford, Conn., decided to try to cut snagging wheel costs by eliminating the less efficient wheels among many different brands in use at M. I. F. He got the Engineering and Production Departments to set up a series of tests in which the comparative performances of 24"x3"x12" wheels from eight different manufacturers were to be rigorously compared over a period of several months.

Then Sherwin Haskell, of Bay State distributor, Perrigo, Inc., New Haven, suggested using a Time-Energy Analyzer to compute contact time and power consumption over the life of each wheel. This made it possible to compare *all* cost factors *accurately.*

cut snagging costs at M.I.F.

Higher grinding pressures were used to increase production. This required a new Bay State specification that resulted in deeper cut, less wheel bounce and maximum wheel economy.

Results showed that the Bay State wheel turned in *the lowest cost per pound of metal removed.* So it became M. I. F.'s standard snagging wheel. And Sherwin Haskell had the satisfaction of knowing that he had helped cut costs for one of the biggest combined malleable iron and steel foundries doing custom work in the entire country.

Like all Bay State representatives, Haskell not only knows the answers to ordinary grinding problems, he often comes up with *unusual* cost-cutting ideas, too. Why not talk to *your* Bay State man? *Better grinding at lower cost—that is his business.*

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

Circle 582 on Page 119

YOU'LL DO A BETTER JOB

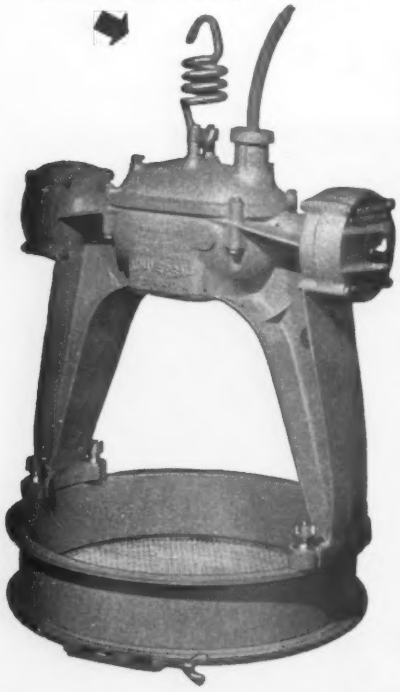
with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

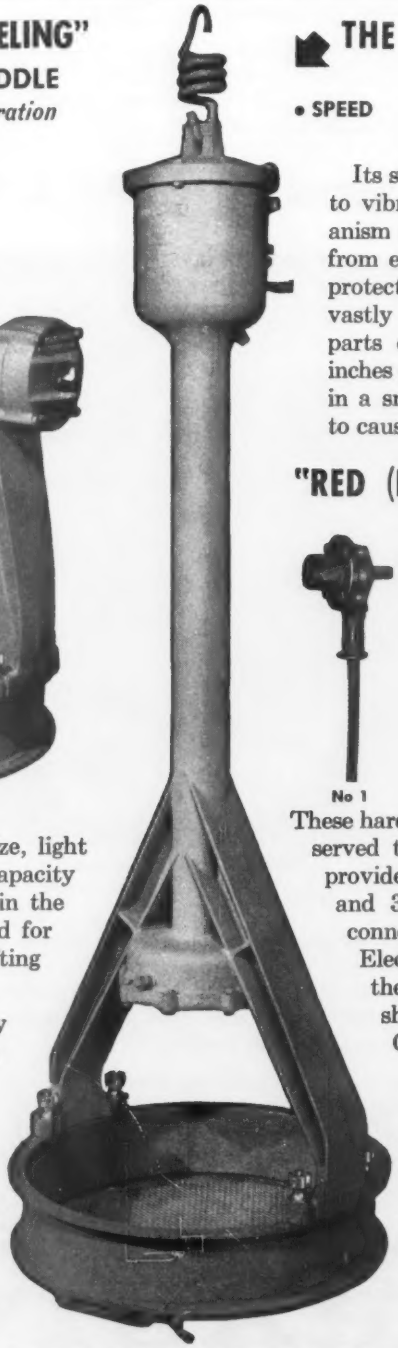


Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.



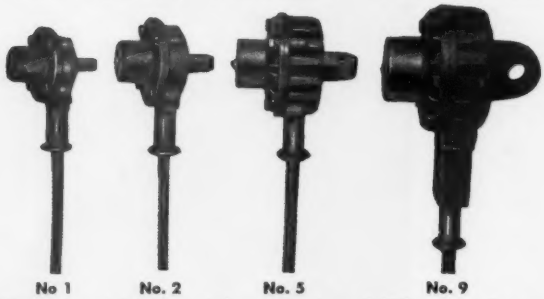
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 — Cable Address: "Rotoplane Chicago" — H. V. ADAMS, Mgr.

Circle 583 on Page 119 — Circle 584 on Page 119→

For truly engineered, truly trouble-free bronzes, specify Federated Silicon Bronzes (50% better ductility, tensile strength up to 65,000 psi); Aluminum Bronzes (heat treated, tensile strength as high as 120,000 psi, with correspondingly high yield strength); and Manganese Bronzes (as-cast tensile strength 125,000 psi, good ductility, high hardness). Federated Engineered Bronzes are the end results of highly perfected production techniques and continuous quality control procedures developed by experienced metallurgists in Asarco's Central Research Laboratory. Ask your Federated field man about Engineered Bronzes and Federated's complete line of quality-controlled copper base casting alloys. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

BAD BREAKDOWN becomes Lucky Break for STUDEBAKER

How auto manufacturer's 13th Simpson Mix-Muller turned trouble into tonnage on manifold line

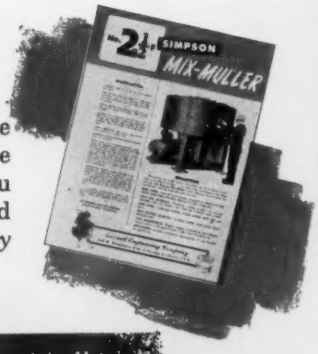
It was December 10, 1956. Studebaker-Packard Corporation was in full swing on their new models—when "old faithful" gave up the ghost. A 10-year old mixer used to prepare all molding sand on the manifold line had suffered a major breakdown. All of their other mixers were *Simpsons*—no chance of switching parts. Things were bad—30 days wait for repairs and the whole slinger line was down.

The fit was tight—⅜" clearance at one point; and delivery was a problem. But, *one week later* Studebaker Foundry took delivery on a new 2½F Simpson Mix-Muller.

Shortly thereafter the new Simpson was turning out *twice* the amount of sand per hour, per batch and per day. The slinger line was back in operation with more and *better* sand . . . to produce quality parts consistent with the Studebaker-Packard reputation.

What seemed to be a bad breakdown turned into a *lucky break* for Studebaker. Here's what else they got with the 2½F Simpson Mix-Muller that they didn't expect to buy:

- **Two times more sand with an $800 per year savings in horsepower (60 HP now—100 HP previous).**
- **Big batch capacity at slower speed meant that no special cooling devices were needed.**
- **Hot sand and loss of fines through cooling was eliminated.**
- **No major repairs to date and excellent plow life is reported.**
- **Lower sea coal costs.**
- **More positive moisture control.**



Why wait for YOUR next mixer breakdown? . . . to weigh the value of more and better sand against the doubtful economy of expensive and often hard-to-get, repairs. Let your NATIONAL agent show you modern mulling, in action . . . There's a Simpson Mix-Muller equipped shop near you and there's a Simpson Mix-Muller for your *every* foundry requirement.

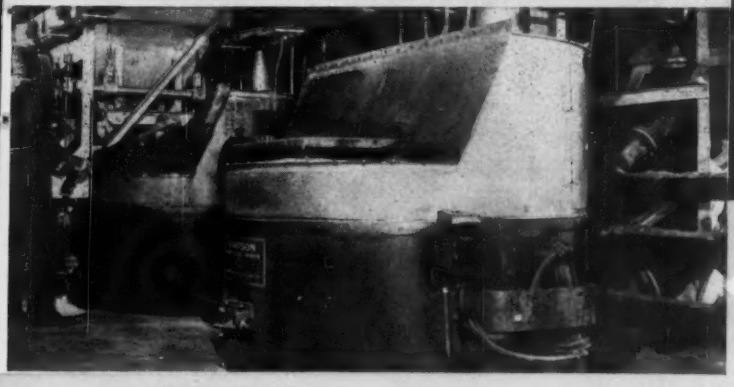
Write for Specification Sheet on the 2½F Mix-Muller

ONE OF A SERIES:

Why practical foundrymen select Simpson by *Four to One*

2½F *SIMPSON MIX-MULLER* handles all molding sand requirements for Studebaker's manifold line at South Bend, Ind. foundry. Unit has: increased sand output, eliminated hot sand, slashed HP requirements and improved sand quality.

PHOTOS SHOW Mix-Muller shortly after installation. Temporary dust shield and undersize hopper will be replaced with dust tight hood, enclosing new full size National batch hoppers. Duct at right formerly exhausted hot air, condensates (and fines) to roof. Cooling is no longer necessary with the new Mix-Muller.



12 OTHER MIX-MULLERS serve Studebaker Foundry in all of their foundry operations.

NATIONAL ENGINEERING COMPANY

ANOTHER! PROVEN PRODUCT OF THE PRACTICAL FOUNDRYMAN BY **NATIONAL**

646 Machinery Hall Bldg. · Chicago 6, Illinois

Circle 585 on Page 119

F-258

How planned test procedures improve foundry profits

To expand the market for castings, foundrymen gain by impressing their customers with the importance of better designs and realistic specifications. If this is done at the outset, your own profit and your customer's continuing satisfaction are assured.

Establish practical design standards

Determine, if possible, the true service requirements and practical characteristics your customer needs. Mutually establish a standard which satisfies the need at a reasonable cost. A good design must be satisfactory functionally, structurally and foundry-wise.

Good design insures trouble-free foundry practice, profitable operation and customer satisfaction. Castings with even stress flow are more serviceable and are easier to pour. Experimental stress analysis with Ⓜ Stresscoat brittle coatings lets you make design changes without guesswork or wasted effort. Design for service, easy casting and high profits.

Keep your finger on the pulse of production

Ⓜ Magnaglo (Ⓜ Zyglo for non-ferrous) is recommended as a "finger on the pulse" means of determining the causes of any cracking in the foundry. Simple tests immediately after shakeout or cleaning can locate cracks when they first occur. This permits you to take corrective action, no matter what the cause. With sampling inspection you actually control the quality of the entire run as it is being poured. You do not waste time and profits in handling, heat treating, finishing, or machining, intermittent lots of cracked castings. It all adds up to better products for the customers and higher profits for the foundry!

Write for details on how Magnaflux nondestructive testing methods can be employed to increase the yield of usable castings and foundry profits. No obligation, of course!

Lightweight Magnetic Particle

Y-5 YOKE KIT

Provides Portable Inspection

Uniform quality castings are far more important to foundry profits and customers than perfection. For this reason, many gray iron foundries have adopted the Y-5 Yoke Kit for magnetic particle inspection at stages of "in-process" operations. The Y-5 is easy-to-use, fast, light-weight, portable and *low cost!* It reliably detects handling cracks, hot tears and similar defects open to the surface. The Y-5 is a convenient and inexpensive means of checking pilot runs for cracks, or for inspecting local areas of castings after cleaning, machining, etc.

COMPLETE KIT ONLY **$195.00**

F.O.B. Chicago, Ill.

THE HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

MAGNAFLUX CORPORATION

Take Your Inspection Problems to the House of Answers . . .

MAGNAFLUX CORPORATION

7350 W. Lawrence Avenue • Chicago 31, Illinois

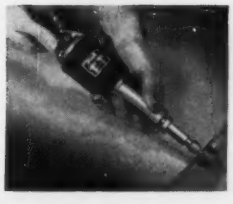
New York 36 • Pittsburgh 36 • Cleveland 15 • Detroit 11 • Dallas 35 • Los Angeles 22

SMOOTHS OUT ROUGH GRINDING JOBS. You don't have to "baby" this Model 700 horizontal grinder. It handles heavy duty grinding, snagging, buffing and wire wheel work easily. Steps up the operator's hourly output, saves you job costs. 6"-8" wheel capacity; 4500-6000 rpm; weighs just 12 lbs. Model 600: 4"-6" wheel; 6000-9000 rpm; weighs 9 lbs.

Is this the AIRETOOL pneumatic grinder that cuts your metal-removal costs most?

FINE FINISHING goes easier with this belt attachment for Model 700 and 600 horizontal grinders. Speeds work on dies, molds, seam welds and contour surfaces.

VERSATILE AND FAST. Model 700-V vertical grinders take down rough spots in a hurry, increase production on flat or curved surfaces. Take a wide variety of cup-wheel, wire brush or flexible disc attachments. 6" wheel capacity; 4500-6000 rpm; weight, 11 lbs. Model 600-V: 7, 8 and 9" disc wheel; 4500-6000 rpm; weight, 9 lbs. Model 500-V: 7" sanding disc; 2300-4000 rpm, weight, 4⅝ lbs.



EFFICIENT TO USE on both precision and production jobs. Model 500 extra heavy duty die grinder works fast around irregular shapes and contours on large molds, dies or patterns. Fitted with collet chuck or threaded spindle for a variety of files, abrasive or wire wheels. 3" bonded wheel capacity; 17,000 rpm; weight, 3½ lbs.

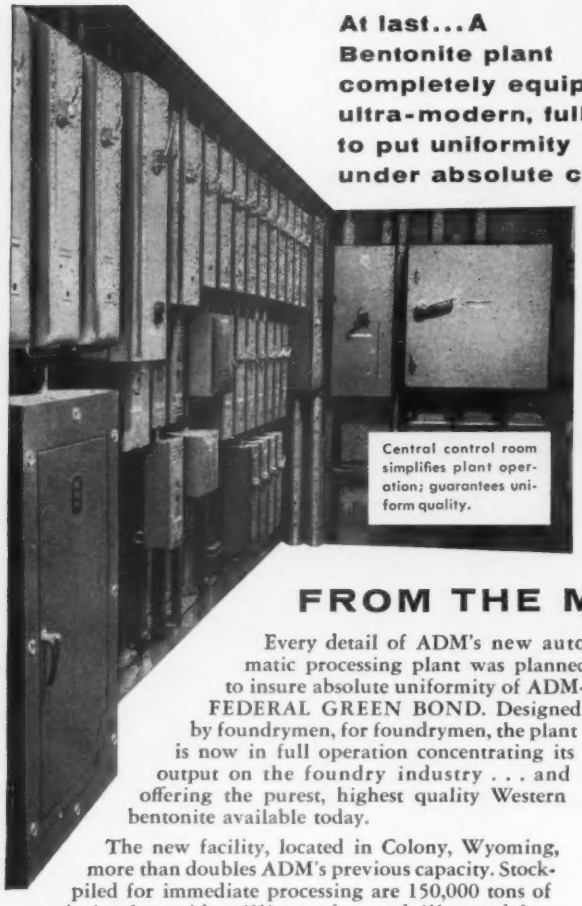
Airetool's versatile grinder and sander line includes a broad variety of pneumatic production tools to save time and costs on foundry jobs. All are efficiently powered to take the heaviest loads in stride . . . no stall or heat up. And, because Airetool grinders are ruggedly built, with a simple, effective lubrication system, they cost you less to use. Catalog No. 63 gives full details of these cost-saving tools. Write for your free copy today.

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge.
REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii.
EUROPEAN PLANT: Vlaardingen, The Netherlands. **CANADIAN PLANT:** 37 Spalding Dr., Brantford, Ont.

Circle 587 on Page 119

At last... A Bentonite plant completely equipped, ultra-modern, fully automatic to put uniformity under absolute control with...

"AUTOMATED" PROCESSING



Central control room simplifies plant operation; guarantees uniform quality.

FROM THE MINE TO YOUR PLANT

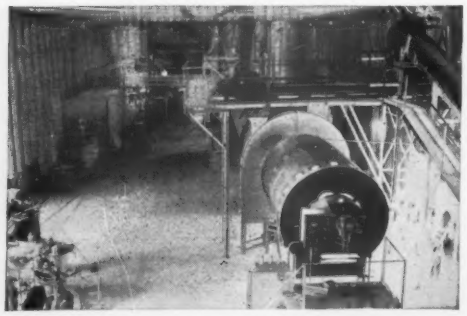
Every detail of ADM's new automatic processing plant was planned to insure absolute uniformity of ADM-FEDERAL GREEN BOND. Designed by foundrymen, for foundrymen, the plant is now in full operation concentrating its output on the foundry industry . . . and offering the purest, highest quality Western bentonite available today.

The new facility, located in Colony, Wyoming, more than doubles ADM's previous capacity. Stockpiled for immediate processing are 150,000 tons of virgin clay, with millions of tons drill-tested for purity and ready for mining.

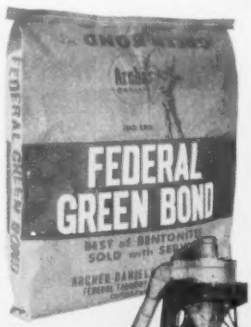
Every chance of human error has been eliminated by the latest production control devices. All measuring and weighing is done by instruments, dryer heat is electronically controlled, material is handled by the most modern pneumatic and belt conveyors, and packaging is completely automatic.

These are a few reasons why ADM-FEDERAL GREEN BOND Bentonite will provide more casting benefits per dollar than any binder of its kind.

The Colony operation is further evidence of ADM's determination to provide the foundry industry with intelligent solutions to their casting problems. Talk to an ADM field service representative today and you'll see these attitudes reflected. Why not visit our new plant soon?

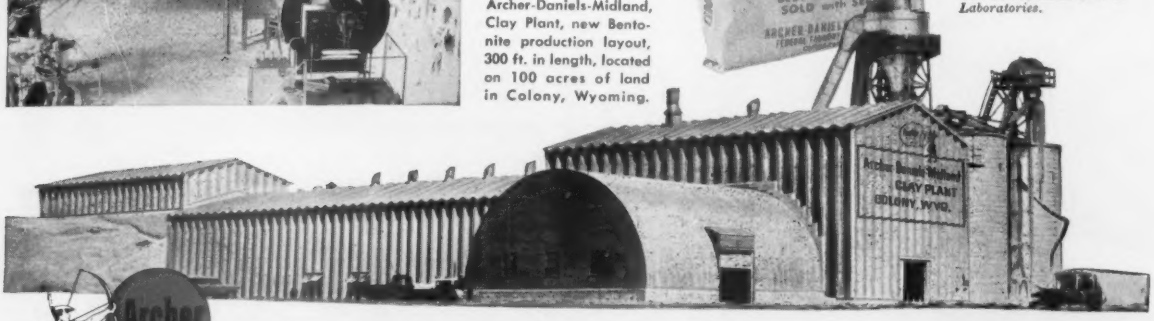


Interior of processing plant illustrates in-line arrangement of equipment. Dryer is shown in foreground.



The new bag design for ADM-FEDERAL GREEN BOND Bentonite is now labeled with the familiar Archer trademark, your guarantee of quality.*

*Two first-place awards in the American Oil Chemists Society's Smalley Check Sample Competition have been won by ADM Control Laboratories.



Archer-Daniels-Midland, Clay Plant, new Bentonite production layout, 300 ft. in length, located on 100 acres of land in Colony, Wyoming.

Archer Daniels Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street • Cleveland 2, Ohio

Circle 588 on Page 119

GET A **Free**

Demonstration

LIKE THIS IN YOUR PLANT

Ask us to prove how a 'Budgit' Hoist can cut YOUR lifting costs

Pick up your phone. Call the nearby 'Budgit' Electric Hoist distributor to send a man out with a hoist. (If he isn't listed under 'Budgit' in the hoist section of the yellow pages, write us.) Tell him you've picked a spot to hang the hoist and plug it in. In the few minutes the demonstration takes, you will know how easy, fast and safe lifting can be.

'BUDGIT' IS A MONEY SAVER

Mere pennies pay for all the electricity the 'Budgit' uses a day. It's fast — lifts ¼-ton at 34FPM. One-hand control frees the other hand to guide the load. Each of the two entirely separate automatic brakes alone can hold the load safely. "Quick as a wink" braking saves time in "spotting" loads in machines and for assembly.

No extras to buy. 'Budgit' is a complete lifting tool. Capacities: ⅛ to 2 tons. AC and DC models. 12-volt models operate from truck battery. Priced from $159.

Call your Shaw-Box distributor for a free demonstration today. Or write for Bulletins 15010-14 and 15010-20.

Service stations from coast to coast save time, trouble and money for every 'Budgit' user.

58A-3

MANNING MAXWELL & MOORE INC. M M & M TRADE MARK

'Budgit'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.

SHAW-BOX CRANE & HOIST DIVISION

386 W. Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Reiief Valves and 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

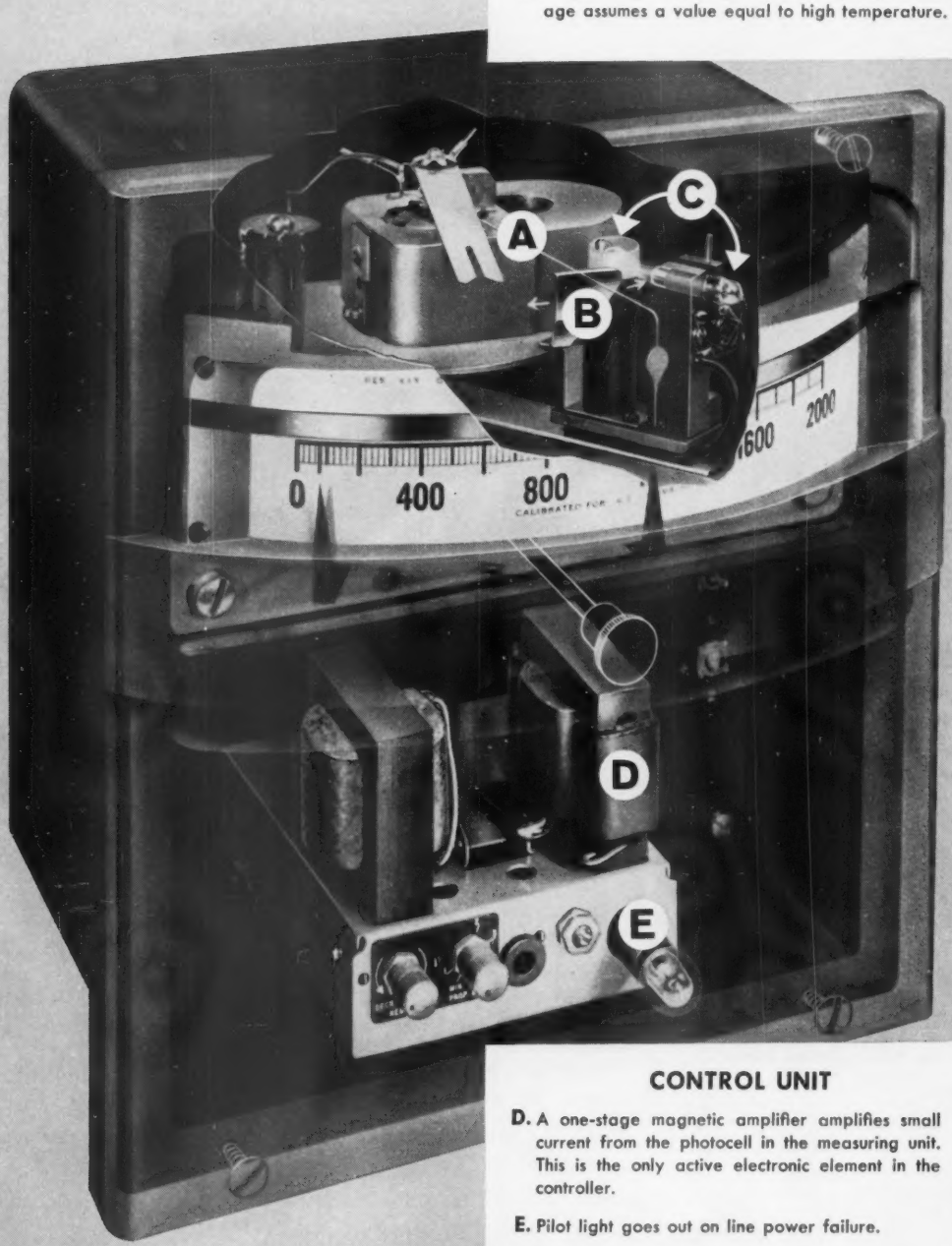
Circle 589 on Page 119

MEASURING UNIT

A. A thermocouple signal to a d'Arsonval galvanometer, the only moving part, moves the indicating pointer up scale.

B. Aluminum vane adjusts the amount of light received by the photocell from the operating lamp.

C. If operating lamp or photocell fails, output voltage assumes a value equal to high temperature.

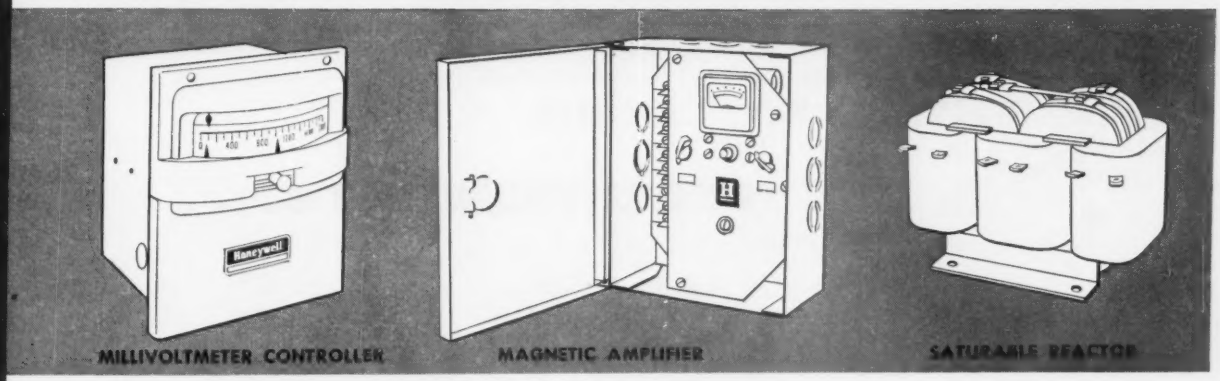


CONTROL UNIT

D. A one-stage magnetic amplifier amplifies small current from the photocell in the measuring unit. This is the only active electronic element in the controller.

E. Pilot light goes out on line power failure.

Pyr-O-Volt **controller is dependable and trouble-free. Built-in voltage regulator maintains voltage within ±1% of level required for maximum operating stability. Thermocouple burnout protection is optional. Spare operating lamp is supplied with all instruments. Available in both horizontal and vertical case models.**



For your electric heating applications...

Use this dependable, low-cost *Pyr-O-Volt** controller

- No tubes to wear out
- Voltage regulation
- Fail-safe design
- Contactless, stepless control

Here's a low-cost instrument for reliable stepless control of saturable reactors, r.f. generators and other power amplifiers. It has a proportional band adjustable from ⅔% to 5%, and a manual reset adjustment which shifts the control point over 100% of the proportional band.

You can use this proportional output millivoltmeter-controller with the General Electric *Reactrol***, and the Westinghouse *Furnatron*.*** Combined with a Brown magnetic amplifier, it can control saturable core reactors up to 100 kva. Complete packaged systems available.

Contact your nearby Honeywell field engineer for complete details. He's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

HONEYWELL *First in Control*

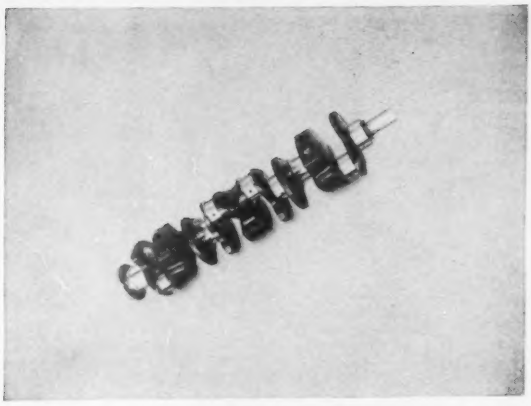
● **REFERENCE DATA: Specification S103-5**

*Tradename, Minneapolis-Honeywell Regulator Co.
**Tradename, General Electric Co.
***Tradename, Westinghouse Electric Corp.

Circle 590 on Page 119

WHATEVER YOUR SHELL MOLDING REQUIREMENTS...

THESE SUCCESSFUL CASE HISTORIES
ARE ONLY TYPICAL . . .



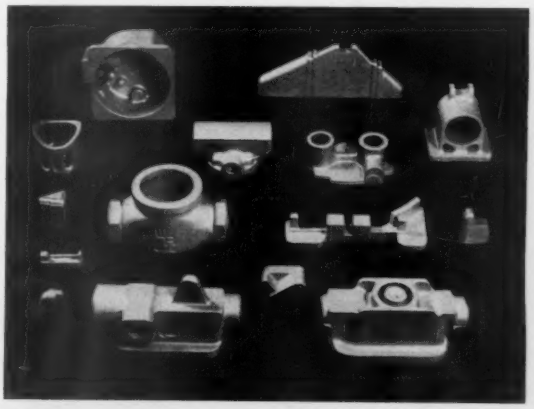
BAKELITE Brand Resins are used to make precision parts for automobile engines. This crankshaft is typical of many parts that are mass produced by mechanized shell molding techniques. Notice the smooth surfaces in spite of the fact that machining and grinding are held at a minimum. Estimates indicate that shell molding has cut these operations in half.

there's a BAKELITE Resin to do an excellent job

That's because Bakelite Company produces such a wide *variety* of fine quality resins for shell molding. You benefit by this greater selection because it makes it easier to find the formulation best fitted to your needs.

In addition, you can count on expert technical assistance. Bakelite Company was a pioneer manufacturer of shell molding resins in this country, and thus has a wealth of experience to put at your service. For information, call your BAKELITE representative or write Dept. IF-10E.

This stainless steel casting was made by Pacific Alloy Engineering Corp., San Diego, Calif., in a shell mold made with BAKELITE Brand Phenolic Resin. The thirteen-inch diameter was held to a tolerance of ± .015 inches, and the finish was 125 RMS or better. During production, 3,089 castings were made without a single reject.



Hutchinson Foundry Products Inc., Alton, Illinois, uses BAKELITE Brand Phenolic Resin to produce cost-cutting castings. These castings are only typical of the variety of shapes ...fine detail...smooth finish and close tolerances that result from BAKELITE Brand Resins for shell molds and cores.

It pays to formulate with

BAKELITE BRAND **PLASTICS**

UNION CARBIDE

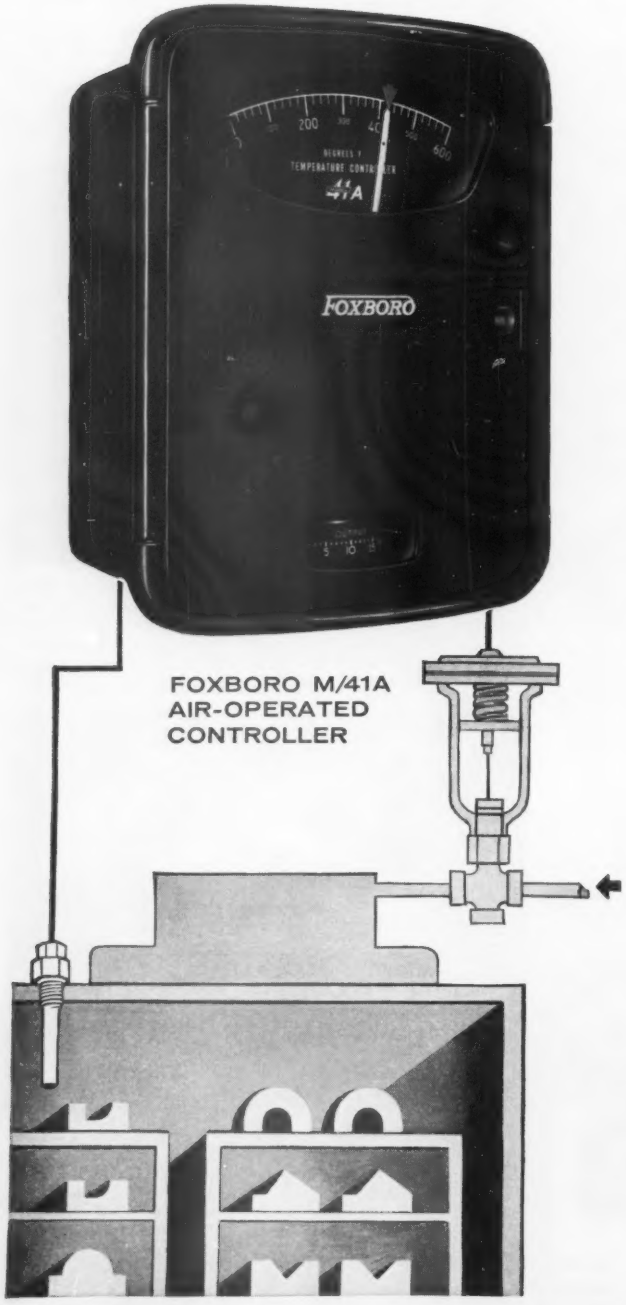
BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

Circle 591 on Page 119

WHY RISK CORE FAILURES?

... meet critical baking requirements precisely



FOXBORO M/41A
AIR-OPERATED
CONTROLLER

WITH FOXBORO M/41 CORE OVEN TEMPERATURE CONTROL

You can be *sure* that you are maintaining the critical baking temperatures which today's complex sand mixes require . . . when your core oven is equipped with the Foxboro M/41. There's no guesswork: This Controller's large indicating scale continuously shows "set" temperature and actual oven temperature . . . proves to the operator that cores are getting the specified bake *precisely*. And models are available for every type of heating system.

Both the M/41A (air-operated) and the M/41E (electric) sense the smallest changes in temperature . . . both respond with positive-power control action. Both are high-accuracy devices, built for years of dependable, trouble-free service.

Protect the quality of your core production with quality core oven control. Specify Foxboro M/41 Temperature Control (air-operated or electric-operated) on new equipment, or install easily and quickly on your present ovens. For detailed information, write for Bulletin 5A-13A. **The Foxboro Company, 329 Neponset Avenue, Foxboro, Massachusetts.**

FOXBORO
REG. U.S. PAT OFF.

COMPLETE FOUNDRY INSTRUMENTATION

FOUNDRYMEN...

who look for quality look to... NATIONAL* Western BENTONITE

Foundrymen, the world over, make quality their first requirements in bentonite. NATIONAL Western BENTONITE... *the product of quality*... conforms to these requisites.

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Circle 593 on Page 119

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Bring Them in Line

Bad news seems to travel faster than the more favorable variety. Any business decline quickly becomes the subject of concern, and everybody talks about the sad state of affairs in the industry. Foundrymen surely have done much complaining about lack of orders and the resulting curtailed operations during the past year.

The tremendous problems connected with keeping a company in business during depressed times evidently dull the perception. Many foundrymen approach any business improvement with great caution, if not disbelief. They evidently are not willing to admit development of an upturn or to consider it permanent until the evidence is overwhelming.

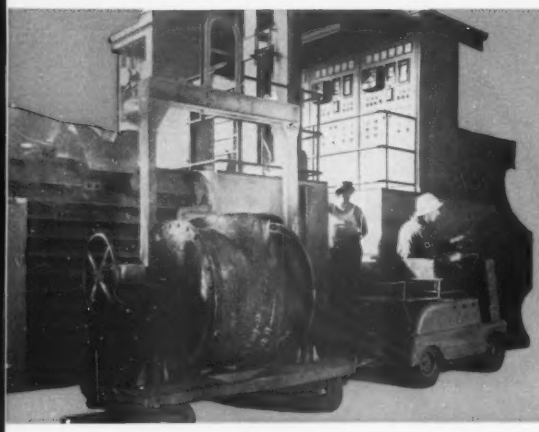
Under such circumstances, requests for quotations frequently are considered as though they were requests to cut prices rather than opportunities for sales at a profit. Management still talks recession when it should be recognizing the implications of recovery.

Although the improvement may not be classified as vigorous, many foundries are showing some gain. Reports from various sections indicate somewhat better business now and a considerably improved outlook for the remainder of the year. Furthermore, the experts in the field of economics indicate that the recession has turned the corner, and production is on the way up.

Today, the price structure in the foundry industry is of much greater importance than the matter of orders. For months, foundrymen have been using unrealistic, ruthless price cutting as the major tool to get business to hold an organization together. At a time when such basic industries as steel and aluminum have announced price increases, foundrymen are indulging in cut-throat competition that already has weakened numerous organizations and will hurt still others in the future.

The time has arrived for foundrymen to talk better business, to get out and sell on quality and delivery, to give the hard sell on conversions, and to get prices back in line with those of other basic products.

Frank G. Steinebach
Editor



Swiss Foundry . . .

Modernizes Melting

Four electric furnaces and two cupolas provide flexibility to melt nine grades of iron and to pour castings weighing up to 45 tons

Fig. 1—Electric tractor and drum ladle

By DR. VICTOR FREY
Escher Wyss Ltd.
Zurich, Switzerland

WHEN Escher Wyss Ltd., Zurich, Switzerland, remodeled and modernized its foundry during 1950 and 1951 (See "Modern Swiss Foundry," FOUNDRY, January 1954, p. 104), no changes were made in the melting department. Since then, increased production has required complete remodeling of the melting plant.

Today, with production three times what it was before the modernization program began, all melting is electric except when very large castings are made. Melting for other castings is done in three 4-ton low-frequency furnaces and one 3-ton arc furnace (the latter held over from the old melting department). Two 7½-ton cold blast cupolas are used in production of the largest castings.

The foundry pours castings ranging from the smallest sizes to as much as 45 tons, made in either green or dry sand molds. They are produced daily in nine grades of gray and nodular iron and include housings for water and steam turbines, thin-walled shapes, and parts for machine tools and general machinery.

Production Facilities — The molding department consists of dry and green sand molding divisions, in which production by weight is approximately equal. The molding department includes six semi-automatic molding machines and a small stack molding machine. Other green sand molds are made on a stationary sandslinger. A traveling slinger for box and pit work is available to make dry sand molds for large and medium-sized castings.

A remotely controlled sand system includes a fully mechanized central preparation plant and belt, pneumatic, bucket chain, and screw conveyor handling equipment. Small and medium molds are shaken out by a number of vibrating shakeouts equipped with a dust suction system.

Since most work consists of individual castings and short runs, only three coreshooters and two coreblowers are employed in the coremaking department. Standard oil sands are used for these cores. Handmade cores are made chiefly with a cold-setting mix. Cores are dried in two electrically heated ovens.

The cleaning department is equipped with a high-pressure water blast unit for large and medium castings and with two shot blast machines for small castings. Like the pouring and the sand preparation departments, the cleaning room is provided with an efficient suction system to remove harmful dust. All stationary machines are connected to a dust-removal circuit. This anti-dust system has produced excellent results throughout the foundry.

Material handling facilities include two cranes for each floor, two electric tractors with a number of 4-ton trailers, a fork lift truck, and a hydraulic loading shovel. Standard gage rolling stock is used for extra-heavy freight.

New Melting Furnaces—To provide the melting system best suited to prevailing conditions, eligible furnace types and combinations were studied on the basis of iron requirements and tap weights during previous years. Molten iron requirements vary from day to day at the ratio of 1 to 2, depending on the weight of the largest castings. These requirements also vary widely in a single day and show a distinct peak in the afternoon.

The green sand department needs iron continuously from morning till evening, but the dry sand department cannot as a rule take the iron before the afternoon. Since its molds are dried overnight and finished in the morning, they are not ready for pouring until shortly before noon. Unfortunately, completed molds cannot be left to stand when furnace capacity is temporarily inadequate. The space and the flasks are needed for other castings, and rejects increase if molds are not poured.

Only electric furnaces proved capable of coping with these wide variations in volume and grade. It therefore was decided to melt current production in electric furnaces and to use the cupolas exclusively for production peaks—that is, when large pieces are cast.

Plant

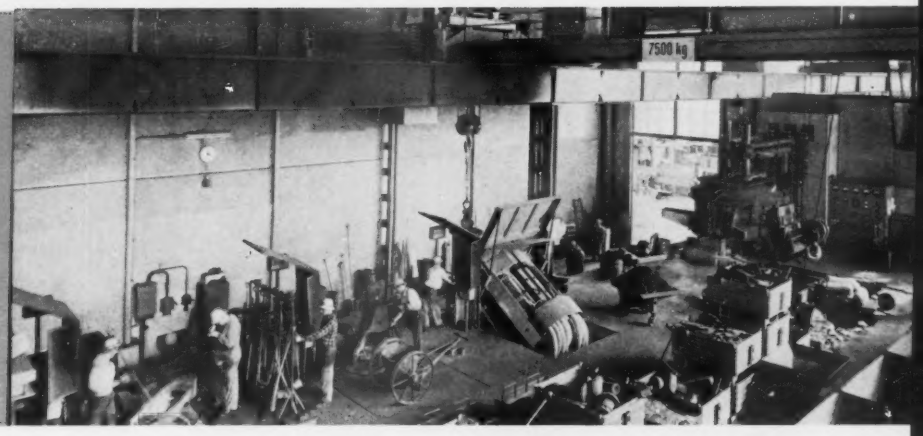


Fig. 2—Four electric furnaces are charged from platform 6 ft 4 in. above foundry floor. Cupolas, not visible, are along another side

Low-frequency induction furnaces were selected because the converter group would not be needed and because of the stronger bath motion in comparison with medium-frequency systems. Elimination of the converter group means smaller investment, higher efficiency, and lower electric power consumption per ton. The strong bath motion permits faster melting of turnings and quicker acceptance of corrective additions. The disadvantage of a cold start with large blocks has to be accepted. This is a minor consideration, however, if the furnaces are in continuous operation for a whole week.

The decision to purchase low-frequency furnaces naturally was preceded by metallurgical tests. For this purpose, three different grades of cast iron with specified chemical analyses were melted in various types of melting units, such as cold blast and hot blast cupolas and arc and induction furnaces, and were tested under a diversified test program.

These tests disclosed that iron melted in the induction furnace not only is equivalent to cupola-melted iron, but in many respects is superior. Metal can be treated and corrected in the crucible until the desired analysis is achieved, and the structure can be modified by various methods. In crucible melting, no contamination is caused by the melting process itself. The iron is of high purity and can be cast at any high temperature desired. High efficiency of these furnaces results from inexpensive operation, low melting loss (especially with nonrusty material), and low rate of rejects.

These furnaces were selected for the new melting department: 1. Three low-frequency furnaces, capacity 4 tons, connected load 860 kw, acid lining. 2. One arc furnace, capacity 3 tons, connected load 1200 kw, basic lining. This furnace was taken over from the old melting plant. 3. Two cold blast cupolas, capacity 7½ tons per hour each, acid lining. Space also is provided for a fourth low-frequency furnace.

This equipment permits simultaneous melting of several grades of gray iron or, by grouping two or three electric furnaces, sufficient iron for large castings. Grouping one or two cupolas and one or two electric furnaces provides enough iron for very large castings. Thus it is practicable to supply the green sand department throughout the day with the volume of molten iron required and to secure the higher requirements of the dry-sand department in the afternoon by making full use of furnace capacity. As already mentioned, the cupola furnaces are not operated except when large items are to be cast. Duplexing also is possible—that is, melting iron in a cupola and superheating and finishing it in an electric furnace.

Location of New Melting Plant—Furnaces nor-

Fig. 3—Storage area. Ingot breaker is on right, and chip mill, sunk in the floor, is on the left

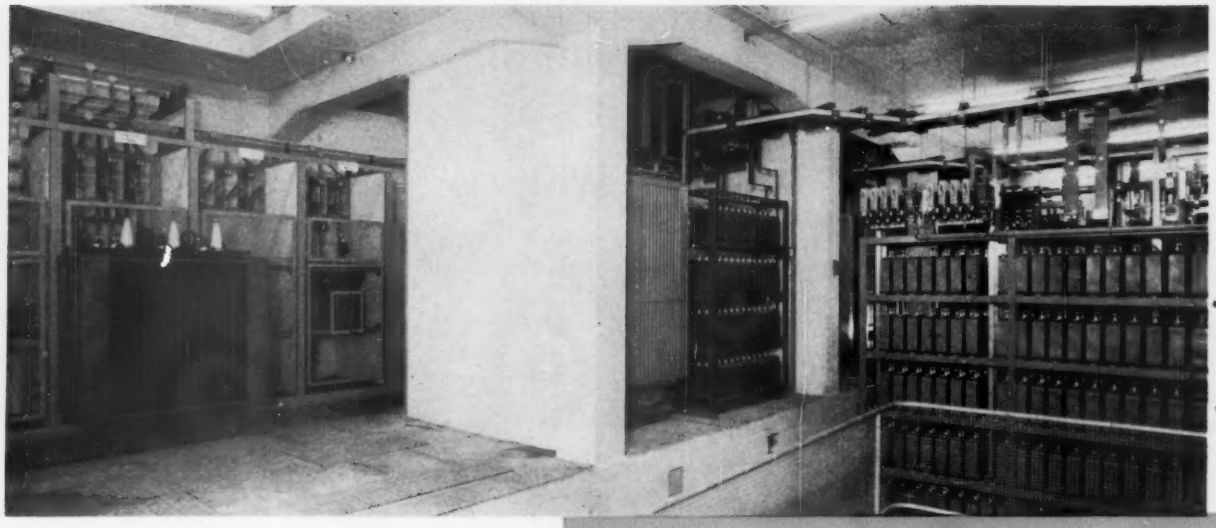


Fig. 4—Entire electrical system, except control panels, is in basement below the charging platform. Each furnace has its own electrical plant

mally are erected close to the pouring area to prevent iron from cooling unduly during handling. Modern transport facilities and runways reduce handling time to such an extent, however, that cooling is slight. Experience with electric tractor trains for the ladles (Fig. 1) warranted the decision to accommodate the melting plant in a separate furnace house. This arrangement resulted in the following advantages:

1. The melting department is provided with its own tackle, especially cranes.

2. Ventilation of the casting shop is simplified because the greatest source of smoke, namely the melting plant, is in a separate building. This benefit is especially important in the manufacture of nodular iron.

3. Since the old building had been demolished, it was possible to arrange the new furnace house to provide space for additions.

4. Two new roads were freed for general transport to the casting department and concreted, thus insuring fast traffic in conjunction with modern transport vehicles.

5. Demolishing the old cupolas freed space for integrated expansion of the core department.

Furnace House—In the new furnace house, the actual working area is arranged on two different levels. The L-shaped first floor is at foundry floor level and is designed for movement of ladles carrying molten iron. This floor also includes space to repair linings and preheat ladles.

The second floor is a large platform 6 ft 4 in. above the foundry floor. On and above this platform, transport of charge materials, makeup of charges, and charging operations take place (Fig. 2). Accordingly, the ceiling was built to hold almost 6 tons per square yard.

Height of the platform is such that the ladles can be filled directly from the electric furnaces without being lifted from the bogies by cranes. The four electric furnaces are arranged along the long side and the two cupolas along the broad side.

Material transport is handled by two fast cranes which can travel out of the furnace house through a wide gate and along the whole length of the stockyard (Fig. 3). One of the two cranes is used chiefly to unload railway cars, fill the compartments of the stockyard, and fill the makeup bunkers. The second crane handles heavy pieces and performs general transport inside the furnace house. In addition, it serves as a spare crane in the event of the other's breaking down.

The daily quota of charge material is stored directly behind the furnaces in makeup bunkers with hinged sidewalls and sloping floors and in standard sheet iron boxes (Fig. 2). To avoid full dependence on crane transport, a lifting stage or elevator capable of lifting the loaded fork truck onto the platform was installed. A scrap shearer, a pig breaker, and a chip mill are available for preparing the charge material.

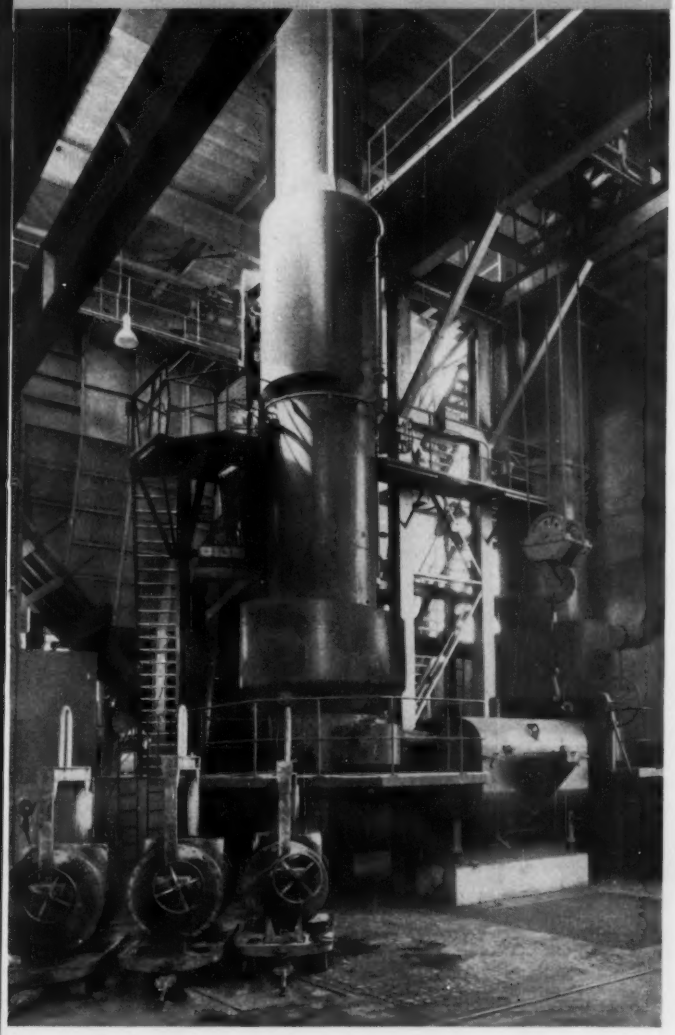
Although the platform is large, it was considered more convenient to accommodate the entire electrical installation, with the exception of the control panels, in the basement below the platform. Each furnace is provided with its own electric plant (Fig. 4) and can be operated independently of the others. The electric plant consists chiefly of a tapped transformer, a symmetrizing arrangement, and a capacitor battery for reactive current balancing. The two last-mentioned units operate automatically.

These electric units produce a substantial amount of heat which has to be dissipated by a fresh-air cooler. Blowers designed for this purpose suck air through a filter from outside and blast it through a branched system of channels to the heat sources. The cooling air is passed out in front of the furnaces and is conducted to the furnace house as fresh air.

A separate room in the basement houses the pumps for the furnace cooling system, which requires special attention. Cooling of the low-frequency furnaces in which the electric coil serves concurrently as a cooling coil may not be discontinued for more than a few minutes, for any default in this respect would cause coil and crucible to be destroyed and the iron to run out. For this reason, apart from spare pumps ready to operate at a moment's notice, the cooling waterpipes are fitted with water guards which sound an alarm if the cooling water becomes unduly warm or the water supply is cut off.

If the pumps themselves cut out, a special valve reacts to the sinking cooling water pressure and causes water flow from the normal plant water supply directly into the cooling system. If the main current should be cut off, an emergency powerplant is connected. It supplies the current required for the emergency lighting and the hydraulic tilting system so that in an emergency it still is possible to empty the furnaces.

Fig. 5—Equipment to control two cupolas, which have a common forehearth, also is situated on landing which is 6 ft 4 in. above foundry floor



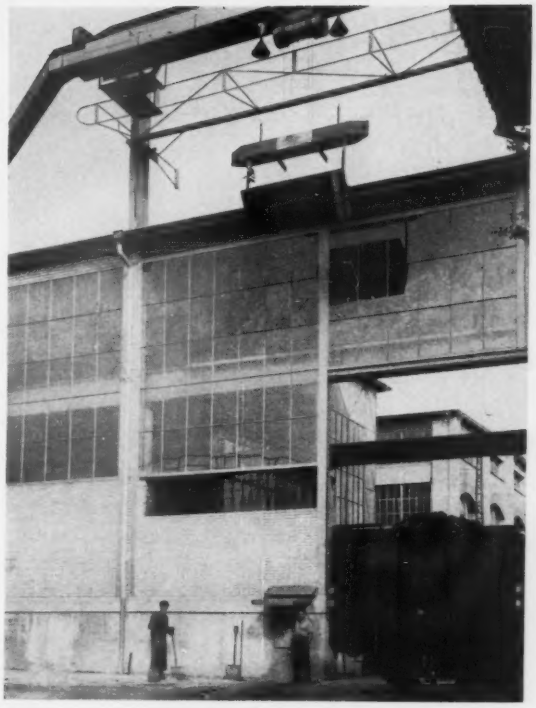


Fig. 6—Coke and limestone storage bin is filled by automatic monorail above roof of furnace house

The cupolas and the joint swiveling charging hoist are our own design. The cupolas are cold blast, but space is provided for a hot blast recuperator. To guard against flying ash and sparks, the chimneys are provided with sprinklers which wash the smoke clean. The iron flows through a continuously-operated slag skimmer into a joint tiltable forehearth.

All elements for controlling and supervising the cupolas are assembled on a landing also located 6 ft 4 in. above the foundry floor (Fig. 5). With this arrangement, the operator has the entire range of his duties at his fingertips. These duties include starting the furnaces; watching the nozzles, slag skimmers and measuring instruments for blast pressure and volume; controlling the blowers; and operating the forehearth drive and the crane for the large ladles.

The large coke and limestone storage bin, situated directly above the opening of the charging hoist, separates the furnace house into electric furnace and cupola divisions. The bin holds a three-month supply of material and is filled by an automatic overhead monorail running above the roof of the furnace house (Fig. 6). Even filling of the bin is insured by the skip's having four tipping stations which can be preselected at the coke unloading station.

The furnace house is ventilated by five roof fans. As already mentioned, the cooling air system of the electric plant is used to supply fresh air.

Operation of Furnaces—All furnaces are charged

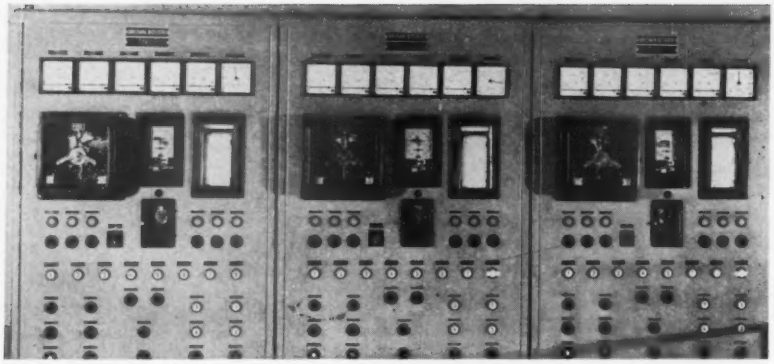


Fig. 7—Control panels for the low-frequency furnaces are on charging platform

from the central makeup yard on the platform. As explained earlier, cranes make ready the material in containers or makeup bunkers in the makeup yard. Two weighing trucks with weight recorders are available to assemble the charges. These weighing trucks pass in front of the makeup bunkers, which are placed in a row, and the material is drawn into the weighing containers. The actual containers have a bottom outlet and also can travel themselves so that the electric furnace charge can be placed ready in a number of these containers beside the furnaces.

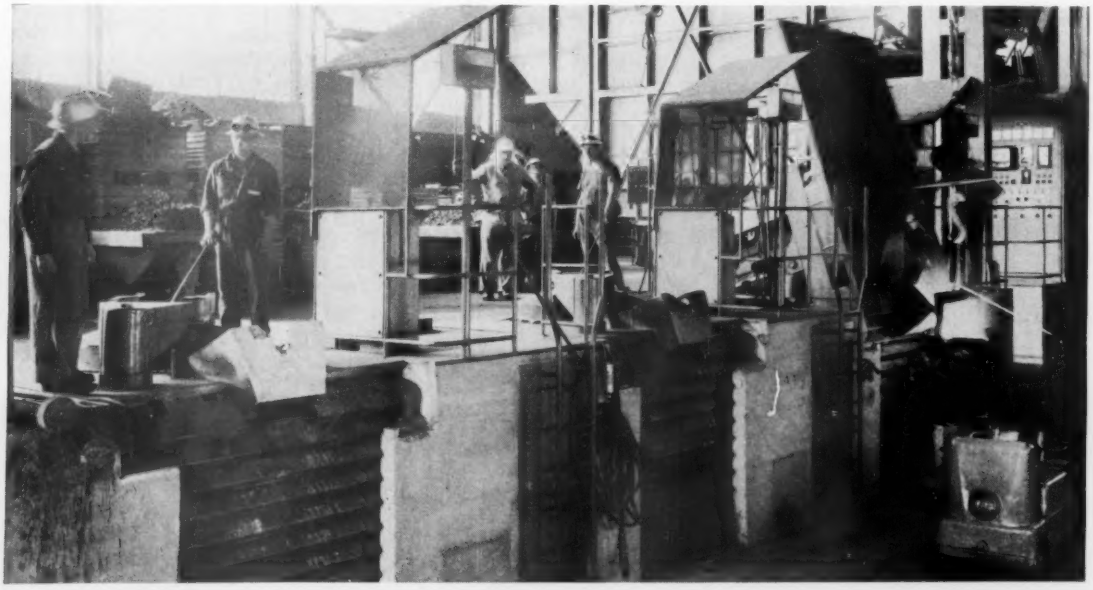
Like the cupolas, the electric furnaces require a precalculated makeup to attain the specified analysis as accurately as possible since every correction of the bath takes time. For this purpose, it is essential to have a fast-working laboratory, without which it would be impossible to make full use of the advantage of crucible melting. The charge is tested by chemical spectrographical methods prior to pouring, thus permitting correction of any deviations from the specified analysis. This procedure achieves continuously uniform composition, with excellent results in respect to reduction of rejects and processing.

Periodically, micrographs of samples and over-all analyses are taken, and mechanical properties are determined on samples. Because exact values of the iron melted in induction furnaces can be reproduced readily, these are highly suitable for material tests.

The low-frequency furnaces are charged chiefly by hand; heavy pieces are handled by the crane. Because the furnaces are sunk into the platform, the material can be pushed over the crucible edge without special effort. The slag which forms continually during the melting process must be skimmed from time to time to prevent it from clinging to the crucible and forming a cover which would prevent temperature checks. Temperature is measured with optical and immersion pyrometers. The latter can be attached beside any furnace. Temperatures are indicated on a large, central clockface and registered, with the number of the furnace, by a recorder.

It has proved most convenient to design the transformers with eight voltage taps so that furnace capacity can be adjusted to prevailing conditions. Adjustment is performed remotely from the control panels (Fig. 7). The voltage tap set is indicated on

Fig. 8—Tapping an induction furnace. Controls on charging platform operate hydraulic systems to lift furnace covers and tilt furnaces



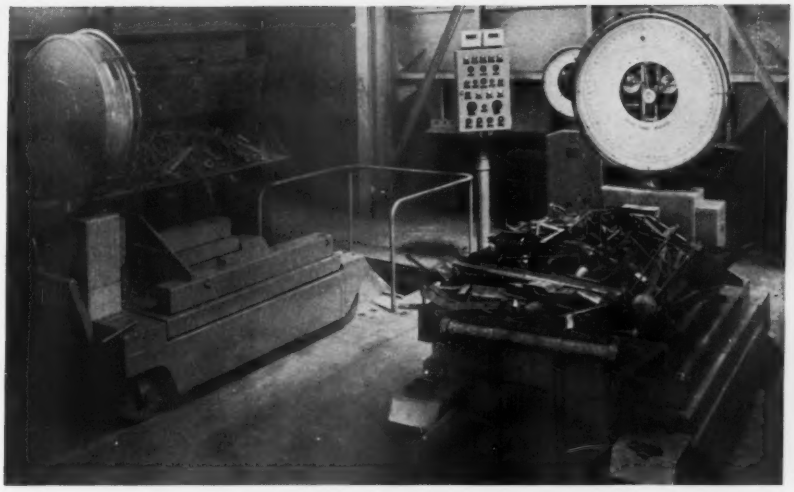


Fig. 9—Charging platform. A 2200-lb cupola charge is hoisted every four minutes

the panels and also on fluorescent screens fitted above the control desks of the furnaces. These desks stand between the furnaces, at the edge of the platform, and provide the controls to operate the hydraulic systems to lift furnace covers and tilt the furnaces (Fig. 8).

Since crucible life is vital to efficiency, special importance should be attached to the ramming and sintering of the furnace lining. The crucible consists of a dry, granular quartzite compound with about 1 per cent boric acid. It is rammed up behind a sheet-iron cylinder until an extremely dense lining has been formed. The sheet-iron cylinder remains in the furnace during sintering and is melted with the first melt. Experience has shown that crucible life is increased when the furnaces are in continuous operation. Cooling down and heating up causes cracks in the crucible wall.

Once a week, however, the furnaces must be emptied completely for checking purposes. On these occasions, they are measured with a special device, and eroded places are filled with a ramming compound. After that, they are ready for another week. In the course of time, the crucible wall grows thin, and it must be broken down and replaced after an output of 700 to 1000 tons.

The charging system of the cupolas had to be arranged for simultaneous operation of both cupolas in order to permit production of very large castings. The cupolas are charged alternately by the swiveling hoist, and a 2200-lb (1000-kg) charge is hoisted every 4 minutes. This 4-minute cycle is maintained by a fully mechanized charging system with preset control (Fig. 9).

At the end of the makeup path, the operator actuates a lever to empty the makeup weigher, and presses the starting knob for the preset control. It triggers the following operations, either successively or simultaneously: 1. Closing or opening of the closing flap in the chute through which the charge slides into the charging bucket, according to whether the bucket has returned from the last charging run or not. 2. Emptying of the automatic coke and limestone weigh-hopper. 3. Swiveling the hoist to the other cupola. 4. Impulse to the charge counter which causes the new charge number to appear on the fluorescent screen of the cupola. 5. Hoisting and conveying charging bucket into the cupola. 6. Emptying charging bucket into the cupola. 7. Return of bucket and closing of bottom flap. 8. Weighing coke and limestone. 9. Level control in the cupola to prevent overfilling. Meanwhile, the next charge is ready, and the cycle can resume.

The level control mentioned above insures an even filling level in the cupola shaft and uniform production. The top level is monitored by a photocell which does not release the charging skip before there is sufficient room in the cupola for the following charge. The level is indicated continuously by pilot lamps on the control panel. Iron temperatures measured are extremely high for cold blast cupolas, and melting losses are normal.

Safety Measures—Safety is improved continually. As a temporary measure, operatives are equipped with goggles, helmets with screens, special boots, and noninflammable overalls. The tilting stations of the furnaces are screened off by wire meshing which affords protection against splashes and heat (Fig. 2 and 8). The convenient layout of the working area is generally conducive to safety. This applies also to the cupolas, where there is always a certain amount of danger in the emptying stage. Here, the situation has been improved by installing a mechanism designed to open the drop-bottom.

Without special safety devices, the automatic hoist also would provide a source of danger. As a result of a slip, the charging skip might empty into the very furnace that is under repair, or it might push into the furnace a man who happens to be checking furnace operation at the top. To prevent such an incident, each charging hole is guarded by a hinged landing which, in its turned-up position, bars access to the furnace top. These landings cannot be turned down unless the hoist is swung to the other furnace. Also, the turning-down operation electrically blocks the hoist from swinging back.

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Mechanized Molding Line
Is Fast and Flexible

High-speed, automatic molding machines team up with efficient material handling to produce 200-220 molds hourly at Albion Malleable Iron Co. Pattern mounting method provides flexibility in output

By WILLIAM G. GUDE
Managing Editor

HOW to attain high-speed operations—and also maintain flexibility in the variety of castings being produced—is demonstrated by Albion Malleable Iron Co., Albion, Mich., which recently revamped two molding lines into one highly mechanized line.

The new line produces malleable and pearlitic malleable iron castings ranging in weight from 1 to 30 lb. They are cast in 40 x 40-in. cast steel flasks having a 12-in. drag and 8-in. cope at a rate of 200 to 220 molds hourly. In an 8-hour shift 140 to 150 tons of metal are poured.

An unusual feature of this installation is that one pair of jolt-squeeze cope and drag machines permits simultaneous production of castings in a wide range of types and sizes—a task formerly handled on two lines by 12 squeezers and 5 cope and drag units. An efficient system of core delivery, mold handling, pouring, and shakeout is a necessary factor in maintaining a high rate of castings production.

Patterns Mounted on Quadrants—It is possible to make a large number of different combinations of castings simultaneously in one flask because patterns are mounted on 18-in.-sq quadrants. Any one of these quadrants can be removed and another one substituted without disturbing the other three (Fig. 1). For small work, as many as 16 individual patterns may be mounted on one quadrant. Each quadrant is fitted accurately into the pattern well and can be reinforced by a grid to prevent pattern deflection under squeeze pressure of the molding machine. The complete four-quadrant reinforced pattern well casting is also used as a molding machine carrier plate.

The two jolt-squeeze strip machines are Herman two-station indexing type with complete automatic controls. The sequence of operations is as follows:

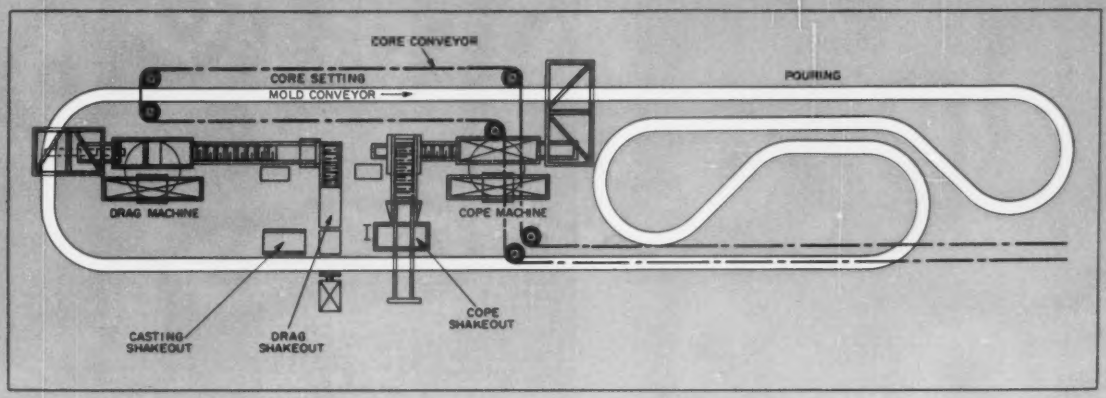
1. An empty flask is positioned above the pattern stripping station as a finished mold is being ejected onto the discharge conveyor.

2. The empty flask is lowered onto the pattern carrier plate and both are indexed or revolved 180 degrees by the central turret to the jolt-squeeze station, as shown in Fig. 3.

3. The flask is filled with sand from an overhead, 20-ton capacity batch hopper and jolted. After the sand is struck off, the squeeze head moves into position and the mold is squeezed (Fig. 4 and 5). Note provision in the squeeze head for forming the two down sprues, also the blocks to accommodate the barred flasks.

4. The mold is indexed to the stripping station; the strip mechanism elevates to strip the mold from the pattern, and the mold is discharged onto a run-out conveyor. As the completed mold leaves the machine the pattern is automatically sprayed with a liquid parting.

Fig. 1—Changing of one pattern quadrant does not disturb patterns of other three quadrants



Showing arrangement of molding units, shakeouts, and mold conveyor. Overhead chain conveyor delivers cores from the central coremaking and storage area

Simultaneous Operation—The indexing feature in connection with the machine's two stations speeds up production by permitting one mold to be made while another is being stripped; also, the indexing of a mold to the stripping station and the indexing of a flask to the jolt-squeeze station are done simultaneously.

Both the jolting action and squeeze pressure are adjustable, and the squeeze piston is provided with a limit stop. Jolting and squeezing are pneumatically operated, and charge and discharge operations, as well as other machine movements, are either hydraulically operated or cushioned for smooth control of the heavy loads. Controls are designed so the machine can be operated automatically or semi-automatically.

Drag molds leaving the machine are discharged onto a roller conveyor, are picked up and rolled over in a bail and set on a car type, powered conveyor. Men stationed on both sides of the traveling conveyor set cores. The cores are received on racks transported by an overhead chain conveyor from the foundry's central coremaking and storage area.

The cored drag molds travel past the cope machine, and the copes are removed from the discharge conveyor by bridge crane and the molds closed. Molds are poured from 2000-lb capacity ladles, with metal temperature about 2700° F. Several loops are made by the mold conveyor, so that the molds are provided an adequate cooling period between the time they are poured and their arrival at the shakeouts.

Shakeout Operation—As indicated in the accompanying layout sketch, the shakeouts are situated

Fig 2.—Cope unit, one of the two indexing type machines. A cored drag mold shown in foreground

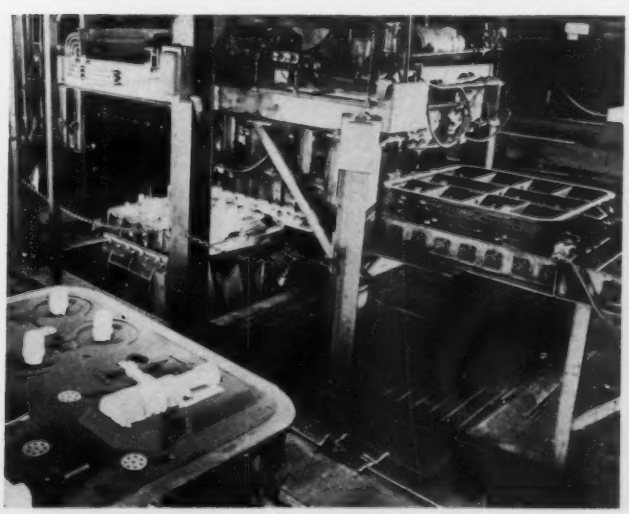
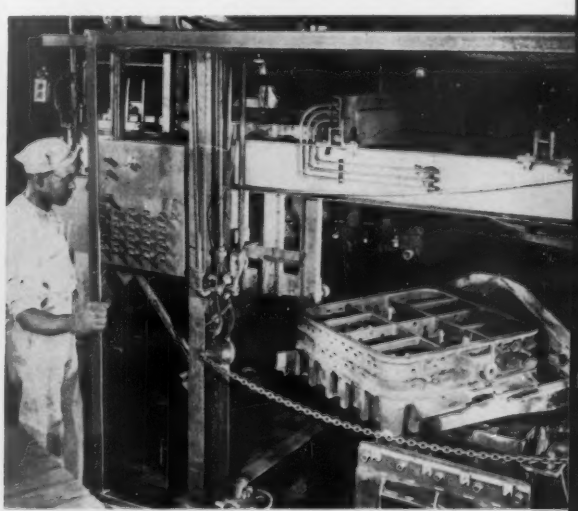


Fig. 3—A cope flask is shown here being indexed to machine's fill-jolt-squeeze station



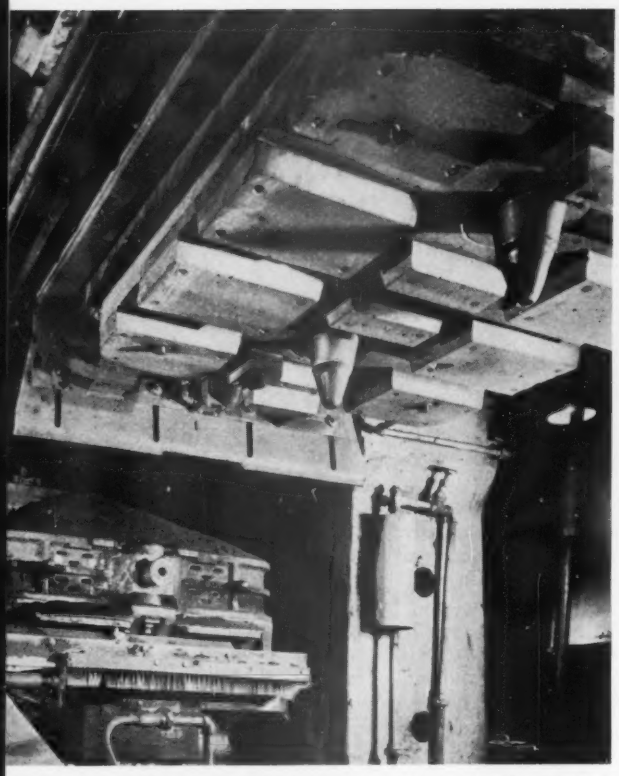


Fig. 4—Cope flask after being jolted. Sand will be struck off before squeeze head, upper right, moves into position for mold squeezing

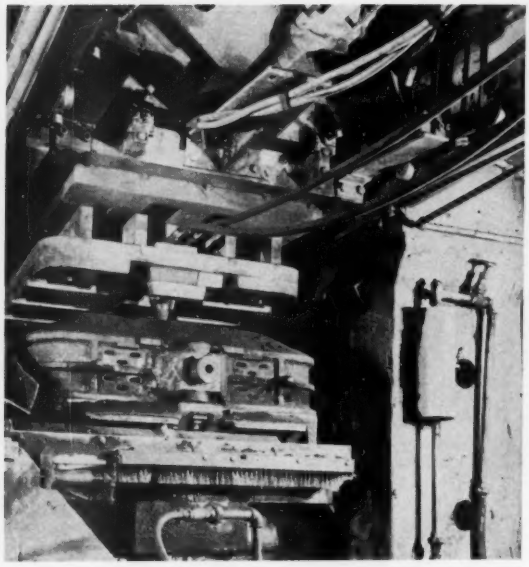
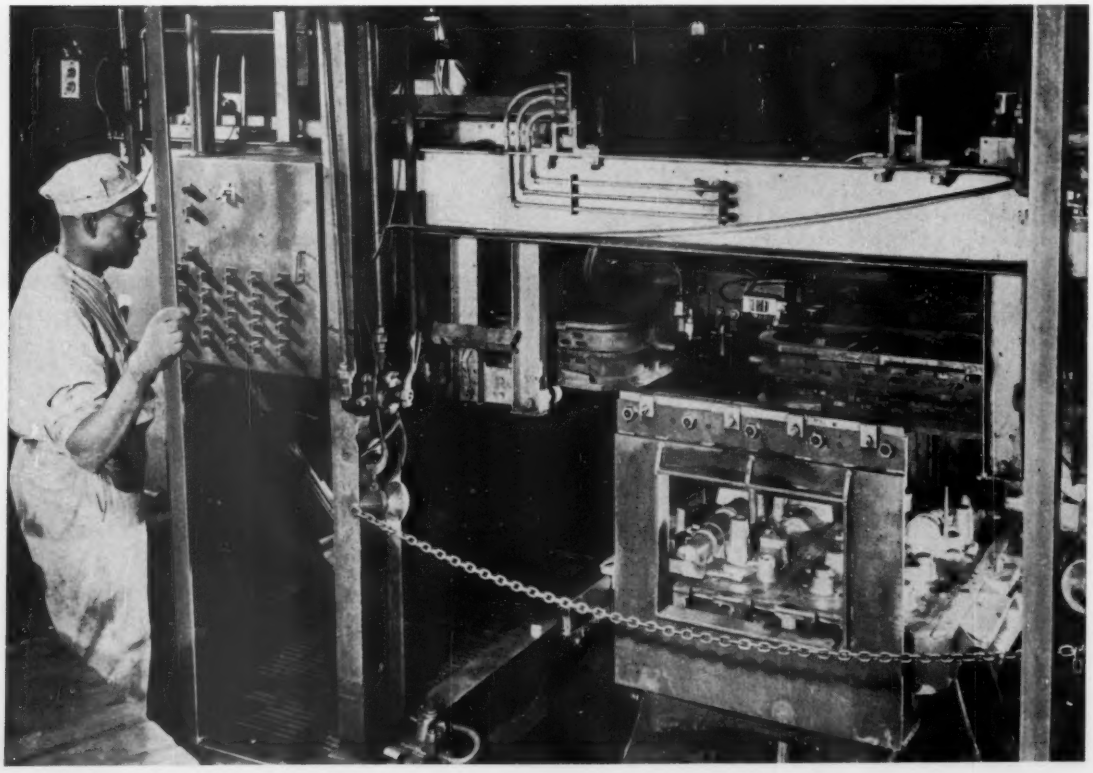


Fig. 5—Squeeze head after moving into place for flask to be raised and the mold squeezed

Fig. 6—Mold at left has been stripped and is being discharged. New flask at right is about to move into place for lowering onto patterns



adjacent to the molding machines. By means of a bail, an operator lifts off the cope and deposits it on the cope shakeout. Here it is raised by a ram before being clamped in place in order to prevent the mating face of the flask from being damaged by vibration of the shakeout grids. After the sand is shaken out, the flask travels by conveyor which, in connection with an air cylinder push-off, returns it to the cope molding machine.

The drag is pushed off the mold conveyor by air cylinder to a throwout table where the castings first are dumped, then pass over a shakeout, and subsequently drop below floor level into containers which carry them away by chain conveyor. Flasks are transferred to their shakeout, next move to a powered conveyor which carries them to a rollover device, and they finally return by powered rollers to the drag molding machine.

Sand used in this operation is a lake sand of 50-55 AFS grain fineness. Sand additions are obtained from the cores used. Mixes are prepared in 1800-lb batches by three mullers equipped with automatic moisture control. Moisture is held at 3.6 to 4 per cent, and the mix shows 10 to 12 lb green compression strength and 80 to 90 permeability.

The sand system has a 200-ton capacity storage bin, and prepared sand is delivered to the 20-ton molding machine bins by belt conveyors. Spillage at the machines is picked up below floor level and returned immediately to bucket elevators which discharge onto belts serving the individual bins.

Three Other Lines — In addition to this line, Albion operates three other lines. One is a shell line also equipped with automatic machines. The other two are conventional lines, one for squeezer work and one a medium-heavy cope and drag line. The four lines provide flexibility for the production of castings ranging from 0.5 to 75 lb. Metal is duplexed in cupolas and oil-fired air furnaces. Castings are heat treated in controlled-atmosphere, gas-fired furnaces, the pearlitic materials being air or oil quenched and drawn as may be required to meet specifications.

Four materials are produced in a total of 18 specifications. They include ferritic malleable iron, several grades of pearlitic malleable iron, ductile irons, and two grades of a special alloy iron.

Fig. 7—Cores being set in drag molds as they travel on conveyor to the mold closing station

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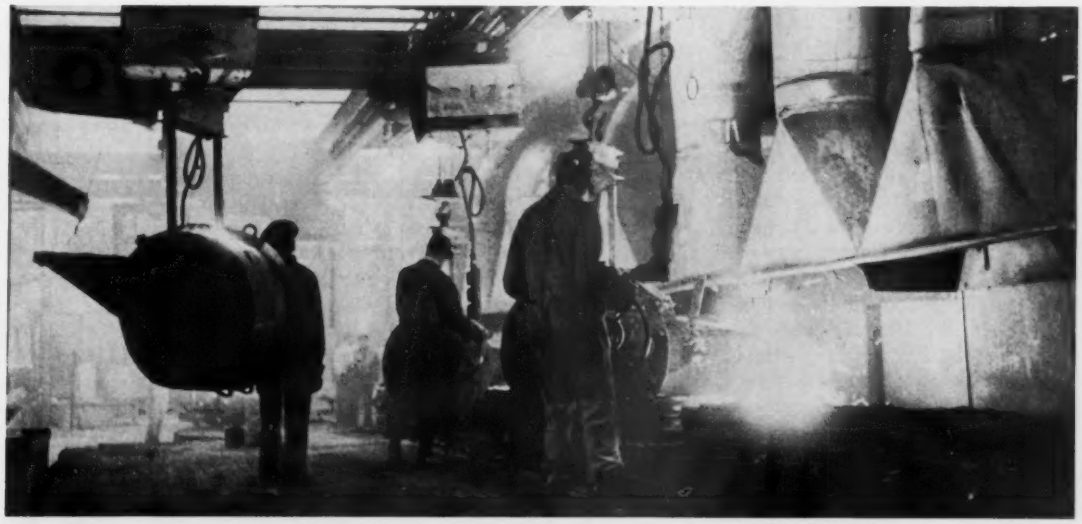
Fig. 8—Molds being poured while moving on car type, powered conveyor line



Gray Iron- - -

CHILLING PRACTICE

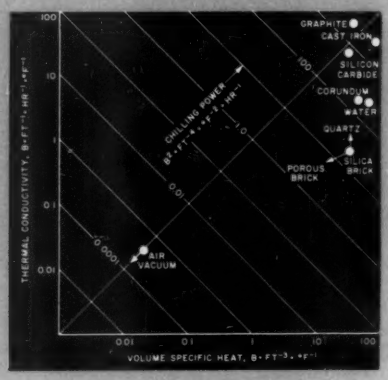


Fig. 1 — Relationship between thermal conductivity and volume specific heat as computed from differing handbook data

Here are results of an investigation to provide information needed to obtain desired chill depth with various gray iron melt analyses by taking advantage of the range of physical properties of graphite

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PRODUCTION of hard, wear-resistant surfaces on gray iron castings by selective chilling is widely practiced, but inadequately understood. The present work was undertaken to provide information needed to give a desired chill depth with various melt analyses by taking advantage of the range of physical properties of graphite.

To avoid possible confusion, the material doing the work of rapidly extracting heat will be called the "structure modifier" or simply the modifier. The term "structure modifier" is appropriate because it covers other applications for the results of this work. They include eliminating shrinkage porosity, improving density and resistance to gas-pressure leaks, modifying the cast structure, and orienting crystal growth, as in cast permanent magnets. The chilled layer will be described in terms of depth, whereas the critical dimension of the modifier will be referred to as its thickness.

To eliminate as many variables as possible, so that results would do the most to enlarge basic understanding of chilling principles, thermal studies were made for unidirectional heat flow between the solidifying melt and the chill block, or contact modifier. This experimental procedure approximates the thermal condition of many castings with which modifiers are used. Results of this work can be used only qualitatively in castings with small lateral dimensions, but may be applied directly where heat flow is approximately unidirectional.

In this work, the iron was melted by induction under oxidizing conditions, but heating times were held constant. New pig iron and steel were used to avoid contamination, and all conditions were held as nearly constant as possible.

To arrive at a reasonable analysis of modifier performance, it was necessary to know what a modifier does thermally and what it does structurally to castings of various compositions. These problems are complex when all variables are included. To underline the primary problems, areas of consideration had to be narrowed to those most vital to the objective. The first was modifier usage in the foundry and the ability of graphite to meet the various requirements.

Practical Considerations of Modifier Usage—Materials for direct-contact modifiers generally meet certain basic requirements in production practice. The most important are low cost and ready availability. Consequently cast iron and graphite are principal candidates. Graphite has a much lower weight per unit volume, with a 4½ to 1 factor to

Fig. 2—Chilling power values for the materials under consideration in this study

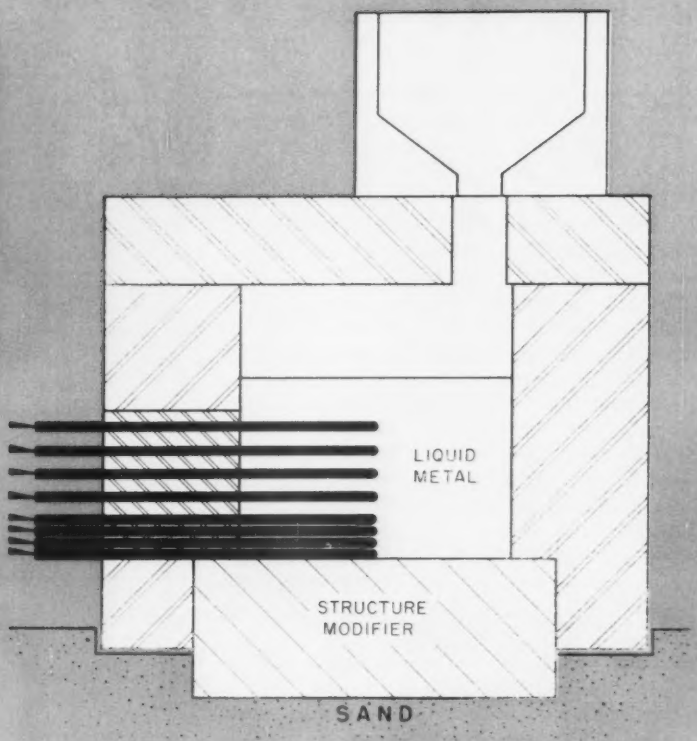


Fig. 3 — Various modifiers were cut from cylinders of 8-in. diam and used in mold arrangement as shown here

balance the difference in cost from that of cast iron. The light weight makes for easier handling and placing in dry sand molds. Graphite is nonwelding and nonwetting to iron. It has been used widely for years and is readily available in grades with highly consistent properties. All the grades are remarkably resistant to cracking. Damage usually is confined to chipped edges and corners. Structure modifiers usually are sealed in green or dry sand except for surfaces exposed to molten metal; in this way, graphite is not damaged by oxidation. When it is exposed to air, oxidation losses are negligible below 350° F.

Like cast iron modifiers, graphite modifiers can be reused and reshaped indefinitely. Their surface is not subject to scaling, intergranular oxidation, or other forms of deterioration that interfere with heat transfer. Uncoated graphite is not subject to blowing and thermal shattering when exposed to severe thermal gradients.

Like cast iron, graphite cannot be used wet or cold. Although graphite modifiers sometimes are used without special pre-heating, it is good practice to store them in a warm place where the temperature may vary in the region of 200-350° F. This practice eliminates the possibility of a porous chilled surface or of blowholes in the castings. For this reason, modifiers are not left in dry sand molds, nor are they rammed in green sand molds more than a few hours before pouring.

Chilling Power—Modifier materials frequently are rated according to thermal diffusivity, conductivity, or length of time they require to solidify liquid metal under standardized conditions. Thermal diffusivity has the advantage of distinct physical units and includes the important factors of density and specific heat. It has the disadvantage of being an abstraction difficult to interpret in familiar terms.

The equation of diffusivity is $D = C/d \cdot h$ where D is thermal diffusivity, C is thermal conductivity, d is density, and h is the specific heat. The dimensional units for diffusivity are l^2t^{-1} measured in cm^2/sec or ft^2/hr. Table I gives some typical values of thermal diffusivity. Thermal diffusivity of air is shown to be greater than that of cast iron, and thermal diffusivity of water to be less than that of air. This order is not in accordance with experience.

To obtain a measure that agrees with experience, we use the term "chilling power," which is similar to the familiar "power" concept in mechanics and electrical engineering. Power means the rate of doing work and consists of an intensity and a ca-

TABLE I—Chilling Power Data For a Wide Range of Materials

	Diffusitivity* (cm^2 sec^{-1})	Chilling Power** ($B^2 \cdot ft^{-4} \cdot hr^{-1} \cdot °F^{-2}$)
Silver	1.700	8760.
Cast Iron	0.121	1930.
Water	0.0017	244.
Air	0.179	0.0036

*Diffusivity data from American Institute of Physics Handbook, McGraw-Hill, 1957, pp. 4-74.
**Computed from data of several sources—data at or near 300°F used wherever available.

pacity parameter. "Chilling power," therefore, is the product of the intensity factor (conductivity) and the capacity factor (volume specific heat).

Note that the difference between chilling power and diffusivity is that the product of conductivity and volume specific heat is used instead of the quotient. Thermal conductivity is a measure of the rate at which a material can accept heat, and the volume specific heat is a measure of its capacity to accept heat.

Thermal conductivity in the English system is measured in $Btu/ft^2/°F/hr/in.$ or more correctly in the dimensional notation $B \cdot ft^{-1} \cdot °F^{-1} \cdot hr^{-1}$. Volume specific heat is the product of density and specific heat. Dimensionally, the correct notation for volume specific heat is: $B \cdot ft^{-3} \cdot °F^{-1}$. The chilling power is the product of these two factors, or, dimensionally, $B^2 \cdot ft^{-4} \cdot °F^{-2} \cdot hr^{-1}$.

The units appear to be awkward, but can be derived readily, and they have the correct physical significance based on everyday experience as shown in Table I. This table includes recent data on thermal diffusivities for materials with corresponding chilling power values which show a much more satisfactory comparison for the purpose at hand. For example, air cells are the best thermal insulators at ordinary pressure, not water, as is indicated on the basis of thermal diffusivity. Experience would lead one to rank water much closer to cast iron, even discounting the added cooling factor of water evaporation. The chilling power data show these materials in the expected ranking order.

Fig. 1 shows a graphic comparison of chilling power for a variety of materials computed from handbook data of several sources. This graph gives chilling power values along the diagonal line. These values are the product of the volume specific heat plotted as the abscissa and the thermal conductivity as the ordinate. The points plotted in this way are referred to the diagonal scale. Insulating materials have chilling power values less than 10 in the English system. The better chilling materials have chilling power values over 1000, and those of some interest as denseners and structure modifiers fall between 100 and 1000.

Fig. 2 shows on an enlarged scale the chilling power values obtained from the data given in Table III for the materials under consideration in this program. These materials represent grades that meet all of the requirements for modifiers outlined above, yet offer a possible selection based on findings of this work.

TABLE II—Properties of Modifiers Used in This Program

Material	Thermal Conductivity ($B \cdot ft^{-1} \cdot °F^{-1} \cdot hr^{-1}$) Longitudinal	Transverse	Apparent Density (g/ml)	Specific Heat ($B \cdot lb^{-1} \cdot °F^{-1}$)
Graphite—AGX	53.3	50.5	1.74	0.245*
Graphite—AGR	52.5	46.2	1.63	0.245*
Graphite—CS-312	49.8	46.2	1.70	0.245*
Carbon—GA	3.2	3.0	1.59	0.245*
Cast Iron	29.5	29.5	7.1	0.107

*Mean value between 68 and 500°F

The GA grade is a carbon different in character from graphite. As expected at the outset, its role is that of a less drastic chilling material. Carbon is more difficult to machine than graphite and is more abrasive to cutting tools. AGX, AGR, and CS-312 are grades with similar properties and are familiar under the term "graphite."

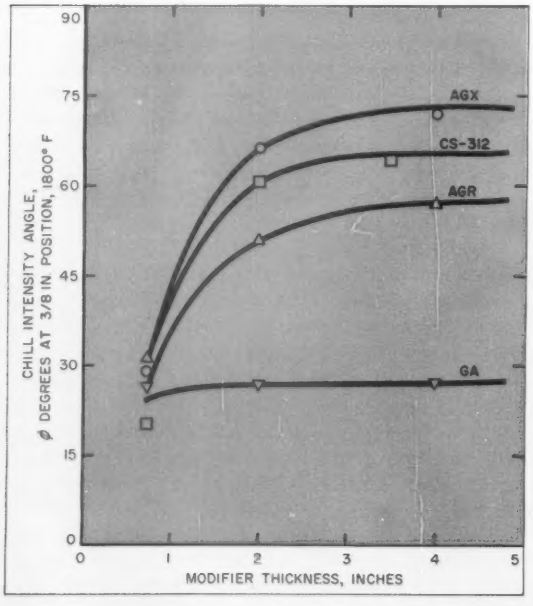
It is concluded from Table II that laboratory data should provide measures of intensity to compare with the computed values shown in Fig. 2. These results would be used, then, in a final method to determine chill depth as a function of melt chemistry and the modifier variables.

Experimental Procedure—The grades of carbon and graphite under study in this program represent widely used and readily available grades most likely to be applicable as structure modifiers. These and the cast iron modifiers were cut from 8-in. diam cylinders and used in a mold arrangement shown schematically in Fig. 3.

The basic model was selected to give unidirectional heat flow from an infinitely large molten metal source. The modifiers ranged in thickness from ¾ to 4 in. A few were thicker. Tests showed that a 30-lb melt covered the modifier with approximately 4 in. of liquid metal. This depth was sufficient to prevent any measurable effect on the cooling rate of the last portion of the solidifying melt.

Effectiveness of the insulation was tested to as-

Fig. 4—Thermal intensity measurements for graphite and carbon modifiers



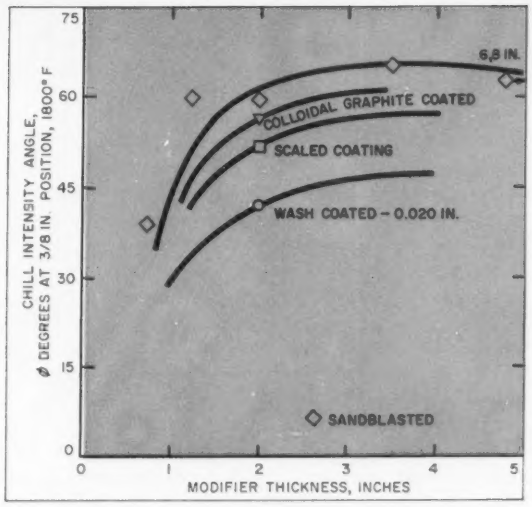


Fig. 5—Thermal intensity measurements on variously coated cast iron modifiers

sure unidirectional cooling at the position where the thermal gradient was to be determined. Casts were made with refractory discs of the same material as the mold sidewalls, showing that the melt was unaffected beyond about $\frac{3}{8}$ in. It is concluded, therefore, that the sidewalls are affected for a distance of not more than about $\frac{3}{4}$ in., leaving a circle about $4\frac{1}{2}$ in. in diam with downward unidirectional heat flow. Molds cast with refractory bottoms were poured at 2350 and 2500° F instead of 2550° F because the higher temperature exposed the thermocouples too long and destroyed them.

The refractory was a high alumina content fire clay selected for its resistance to thermal shock and attack by cast iron and for its low thermal conductivity. It was slipcast in a sheet-metal mold which supported the refractory wall during use. A sidewall slot was left open to receive the thermocouple assembly. This consisted of a wedge cast to fit into the sidewall slot, with eight thermocouple protection tubes arranged as shown in Fig. 3. The protection tubes and other joints were sealed with fire clay.

A fire clay cover protected the casting from heat loss by radiation and also supported a baked core sand pouring cup having a 1-in. hole. The cup was placed so that molten metal did not impinge on the thermocouple array. Pouring time was approximately 5 seconds.

The thermocouple tips were located at the center of the mold. The first thermocouple tube rested on the modifier surface with three others in contact above and the remaining four with $\frac{1}{4}$-in. interspacings. These were held in alignment by a thin, perforated steel strip so that they would not float or shift under pressure of the rising metal.

A 2550° F casting temperature was selected as representative of the average temperature of metal in the ladle when simple molds are cast. This pouring temperature for modifier tests, therefore, corresponds roughly to that which would be experienced by the modifier in production work.

Chromel-alumel thermocouples are not expected to withstand exposure much more severe than that found in this application, in which temperatures of more than 2300° F were recorded. The limiting member of the system was, however, the protection tube. Cold drawn, seamless, low-carbon steel tubing was used, with porcelain insulators 3/16 in. in diam with two holes for the 0.040-in. thermocouple wires. The steel tubing was protected from molten iron attack by a flame-sprayed coating of rutile.

Response time of the thermocouple arrangement was about 15 seconds—short enough to begin most thermocouple records above the freezing point of cast iron, and in all instances above 1800° F, the thermocouple arrangement was judged to be adequate.

The 30-lb cast iron charge was melted in a high-frequency unit. Iron analysis used in thermal studies is given in Table III. Maximum variation in analysis was less than that amount calculated to result in a variation of $\pm 1/16$-in. of chill depth.

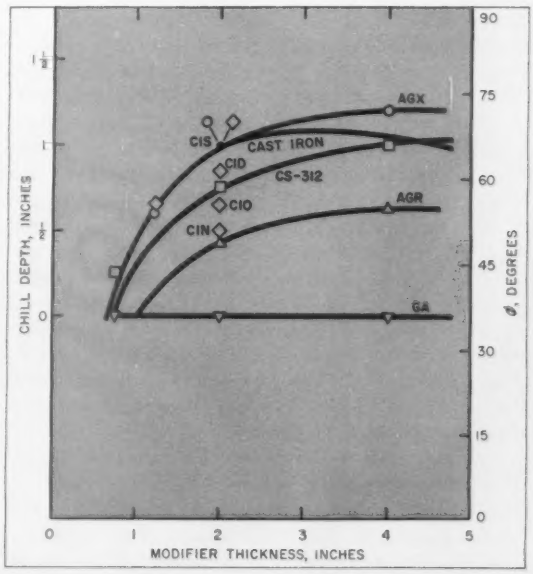
A thermocouple was placed in the mass center point of the modifier in all tests, and a record of

TABLE III—Average Analysis of Cast Iron Melts for Thermal Tests

Elements	Weight, Per Cent
Carbon (total)	3.28
Silicon	1.35
Manganese	0.70
Phosphorus	0.15 max
Sulfur	0.08 max

starting and final temperatures was made. All modifiers were preheated so that their temperatures at the time of pouring were near 250° F. Temperatures reached by the modifiers were determined largely by their thickness, the highest observed

Fig. 6—Summary of chill depth results from castings used for thermal tests



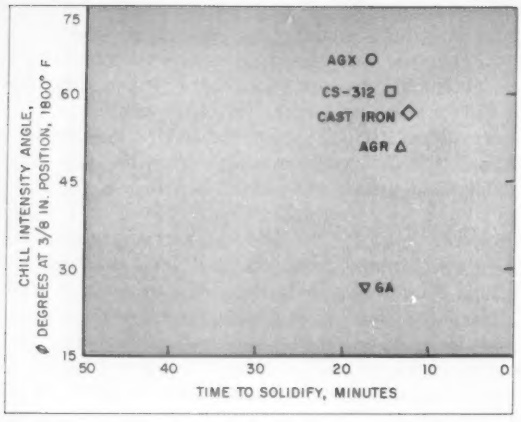


Fig. 7—Summary of laboratory determinations of chilling power of various modifiers

being 1825° F for GA of ¾-in. thickness. Variation in the starting temperature of the modifiers did not appear to account for any deviation in the thermal records of the melt or to introduce a measurable factor in analysis. For this reason, corrections for starting temperatures were omitted.

The eight thermocouples in the mold sent their impulses to a high-speed multiple recording unit via an amplifying and switching circuit. Each thermocouple EMF was sampled by the switching circuit in turn for 1 second, sufficient to arrive at, dwell, and accurately record the temperature of each thermocouple. The thermocouples and apparatus were calibrated with a constant-temperature furnace prior to use. The recording chart was started at the moment of pouring and continued until the neighborhood of 1400° F was reached in cooling.

The method of chill intensity evaluation was simply to measure the slope of the tangent to the cooling curve for a thermocouple close to the chill interface at an arbitrary temperature. The thermocouple used was approximately ⅜ in. above the modifier. The evaluation temperature was selected arbitrarily somewhat below the solidus (1800° F) since the cooling rate near the solidification temperature was of primary interest.

The proposed system will not reflect accurately the chilling intensity of poor chilling materials, but these materials are of little importance to the present work. Fig. 4 shows results of the thermal analysis for graphite and carbon. The chill intensity angle is the angle of the tangent to the cooling curve at 1800° F—i.e., tan = $\Delta T/\Delta t$. The results show a hyperbolic relationship: Inverse of chill intensity is directly proportional to the graphite thickness. Similar tests were made with cast iron modifiers as shown in Fig. 5. All of these modifiers were shot blasted or shot blasted and treated prior to use as indicated in the figure. In thin sections, the shot-blasted modifiers welded to the castings, thus accounting for the high values for the ¾ and 1¼-in. modifiers. It was interesting that a colloidal graphite coating made a marked change in chilling intensity, which fell off roughly in proportion to the thickness of the interface layer. Thus, it theoretically is possible to obtain any chilling intensity by development of the controlled use of various coatings on cast iron, as suggested by Fig. 5.

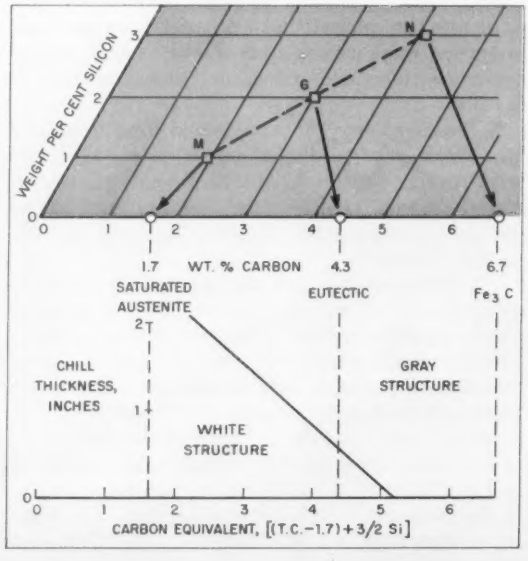
The results of chill depth measurements on fractured surfaces are given in Fig. 6. The similarity of results with the predictions of thermal analysis in Fig. 4 and 5 is apparent. On the basis of the similarity, the possibility was foreseen that a relationship between chill depth and thermal behavior could be developed for other iron compositions, provided that a relationship was established between chill depth and composition.

Fig. 6 has been presented with the lefthand ordinate indicating the chill depth measurements; the righthand ordinate shows the corresponding chilling intensity angle. Comparison of Fig. 4 and 6 shows that zero chill depth is not the same thing as zero chilling intensity. GA of any thickness would not have sufficient chilling intensity to produce a chilled layer on iron of this analysis.

The chilling capacity of materials, or their capacity to accept heat, is visualized as related to the total time required to solidify the casting. In closed mold castings and in the covered ingot castings of this program, it was not possible to observe directly the time to complete solidification. An approximation to this value was obtained from the thermal records. The chosen parameter was the total time for the last thermocouple in the array to reach 1800° F, the same temperature at which the chilling capacity is determined. This thermocouple was located 3 in. above the interface and represented fairly well the region of last solidification.

The resulting chilling powers for the materials in 2-in. thickness have been plotted in Fig. 7. These

Fig. 8—Evolution of new scale of carbon equivalence for use in the chilling of cast iron



results compare qualitatively with those predicted in Fig. 2, even though the experimental work is not based on pure parameters. No direct relationship is to be expected between the results shown in Fig. 2 and 7, except that there should be qualitative agreement.

It is concluded from this experimental work that the method of evaluating chilling intensity is satisfactory and can be correlated with chill depth measurements. Further, if a correlation is found between iron composition and chill depth for constant test conditions, it would be possible to develop an expression for the principal variables that determine chill depth.

Carbon Equivalent—The next problem was to develop a better relationship between chilling effect and chemical analysis of the melt. The carbon equivalent is a rule-of-thumb measure of changes in iron-carbon equilibrium resulting from silicon additions because this ratio approximates the shift of the eutectic composition with silicon additions. Carbon equivalent is equal to the total carbon content plus one-third of the silicon content. This factor has been used to estimate the depth of chill in gray iron of various compositions for many years. There has been considerable dissatisfaction with this measure of chill response, however, because the chill depth relationship varies with the carbon-to-silicon ratio. Loria has suggested a modification based on the judgment that silicon has a much greater effect than is indicated by the carbon equivalent.[1] His new ratio does not, however, completely correct the variation due to changes in carbon-to-silicon ratio.

To develop a better relationship between composition and chilling potential, the iron-carbon-silicon equilibrium diagram in the commercial cast iron region was re-examined. Three general classes of alloys exist. These have fairly ideal compositions if one considers only the silicon content and the resulting tendency to form a white structure with various cooling rates. First, malleable iron contains sufficiently low silicon to show no flake graphite in normal cast sections. Second, in gray iron the analysis is chosen on the basis of minimum silicon contents consistent with a gray fracture in cast sections. Third, in nodular base iron and related compositions the silicon and carbon contents are increased to promote graphitization and suppress the formation of massive stabilized cementite at any cooling rate.

The three nominal analyses for these products are given in Table IV. They are based on the assumption that these three compositions represent the ideal variation in the structural response to chilling. These compositions are not used in commercial practice because of the need to consider various other important factors.

TABLE IV—Ideal Analyses To Represent The Commercial Range of Cast Iron

Iron	Composition %C	%Si	Carbon Equivalent (Total C — 1.7) + 1.5 Si	% White Structure Thin Sections Slow Cool	Fast Cool
Malleable	1.9	1.0	0.2 + 1.5 = 1.7	100	100
Gray	3.0	2.0	1.3 + 3.0 = 4.3	0	100
Nodular-Base	4.1	2.9	2.4 + 4.3 = 6.7	0	0

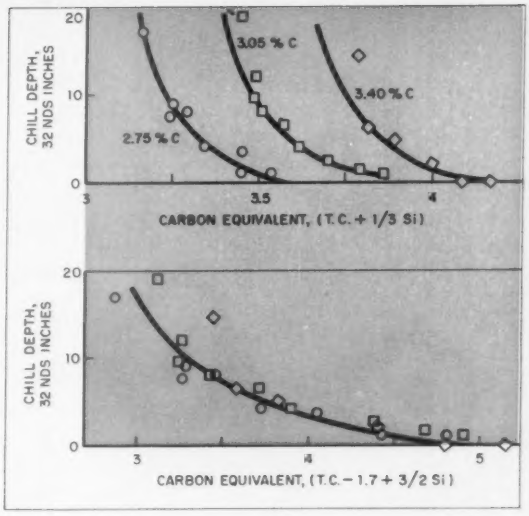


Fig. 9—Wedge-chill test results comparing two carbon equivalent formulas

In the binary iron-carbon system, an alloy of 6.7 per cent C may be regarded as the unstable extreme. At the other extreme is saturated austenite at 1.7 per cent C, beyond which free ferrite becomes stable. Since we are interested in solidification structures, changes in the solid are not important. In the binary system, the saturated austenite and iron carbide become pivot points to establish the true range over which the carbon equivalent range should be extended.

By relating the three iron-carbon-silicon alloys to this range of the iron-carbon system, we have a new scale of carbon equivalence. This transformation is made simply by subtracting 1.7 from the total carbon and adding three halves of the silicon content. This transformation is shown in Fig. 8. The upper region gives the same approximate results as the old $\frac{1}{3}$ Si content factor. The ideal formula for gray iron converts to the eutectic composition of 4.3 per cent C.

The next problem was to test this relationship with the chilling tendency of various alloys. This has been done in Fig. 9 for data of Krause.[2] Krause used the wedge-chill test; so these data have no direct relationship to other results. All variables relating to external modifiers have been eliminated in these results. The wedge-chill test is far from a unidirectional heat flow test.

Krause's results show, however, the agreement between the new carbon equivalent and chill depth for various carbon levels as shown in the lower part of the figure. The upper part of Fig. 9 shows the same data in the conventional carbon-equivalent relationship, with a wide separation for the different carbon levels.

Loria's results have been plotted in Fig. 10 with some new results using carbon modifiers and the unidirectional heat flow method.[1] The new data are given as squares in this figure with the cor-

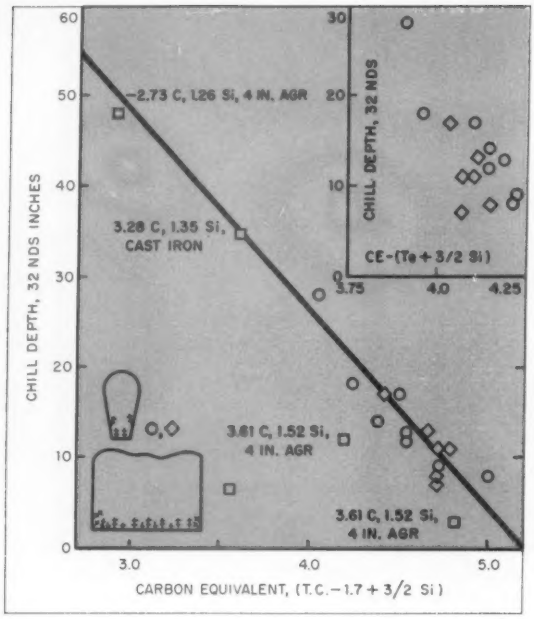

CHILL DEPTH, 32 NDS INCHES
CARBON EQUIVALENT, (T.C.−1.7+3/2 Si)
2.73 C, 1.26 Si, 4 IN. AGR
3.28 C, 1.35 Si, CAST IRON
3.61 C, 1.52 Si, 4 IN. AGR
3.61 C, 1.52 Si, 4 IN. AGR
CHILL DEPTH, 32 NDS
CE-(Te+3/2 Si)

Fig. 10—Chill depth as function of carbon equivalent

responding composition and cover a much wider range of the carbon equivalent scale. Loria's results are plotted in the upper righthand corner, with his carbon-equivalent relationship as the ordinate.

The same data, plotted below in Fig. 10, but with the new relationship, give a much more significant trend. The condition of the cast iron modifiers used by Loria for his test coupons is assumed to be good, as is usually the case for careful workers. Such is not always true, however, of modifiers used on production castings. On the assumption that his cast iron modifier is infinitely thick with respect to the test coupon and that the modifier surface does not vary, these data can be compared.

One point of the present work for a cast iron modifier 4 in. thick, shot blasted and coated with colloidal graphite, compares well with Loria's results. The line for cast iron modifiers has been drawn to represent these data. The results for 4-in. AGR graphite have been included to support this trend, although the values for 4-in. AGR would fall somewhat below the line for cast iron, as would be predicted from Fig. 7.

The chilling power lines for other materials and thicknesses would be parallel to that for cast iron because the thermal behavior is independent of the chill response of the iron. It is concluded from this work that a unique relationship has been established between chill depth in unidirectional heat flow and the carbon and silicon contents of the cast metal.

Conclusion—The culmination of the present work is the nomograph in Fig. 8. The four variables of carbon content, silicon content, modifier grade, and modifier thickness are related to provide any desired chill depth. In the example shown in Fig. 11, it is desired to develop a $\frac{3}{8}$-in. chill depth with an iron analysis of 3.35 per cent C and 1.30 per cent Si. When the carbon and silicon values are connected with a line, the carbon equivalent is determined as 3.6 per cent. This value is connected to the $\frac{3}{8}$-in. chill depth value by a line, and the values for the modifier thicknesses are read on the scale as $1\frac{3}{4}$ in. for AGR and $1\frac{1}{8}$ in. for AGX.

The results for CS-312 are not included in the figure to avoid confusion with those for AGX and AGR. The results show that GA will be expected to develop a chill zone only for very low values of carbon equivalent. A number of other, secondary factors may introduce varied results. For example, the heat flow direction is the longitudinal axis of the stock. Should the samples be cut in another direction, a small error will be introduced, since the conductivity is less in the transverse direction.

There is, however, sufficient confidence in the experimental results to justify presentation of the nomograph for further testing. Such confidence is not held for cast iron at the present time because of the range in possible variations with difference in composition, structure, and, particularly, surface condition of iron modifiers.

Acknowledgment—Thanks are due to National Carbon Co., Cleveland, for supporting this work, and for permission to publish the results.

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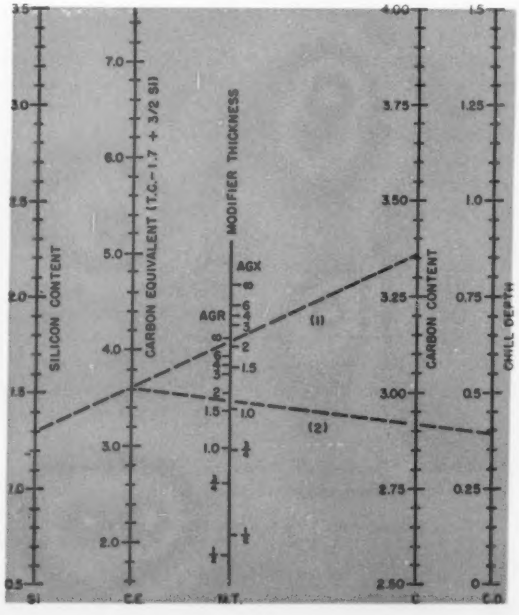
Fig. 11—Nomograph for chill depth in cast iron



Shrinkage Prevention in Bronze Castings

This article is the first of a second series on shrinkage in bronze castings. The first series dealt with effects of dissolved gas. This one will take up feeding

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Fig. 1—Large tapered riser and top pouring give wedge casting ideal solidification

IN A previous series of articles, the author described the effect of dissolved gases on tin bronzes and related alloys which are especially subject to interdendritic shrinkage.[1] It was pointed out that, although this defect would result from insufficient feeding during solidification, it would be considerably aggravated by gas. It was further indicated that if gas were present, it would prevent complete feeding even though the correct gating and risering system was employed.

This is the first of a second series of articles covering molding methods for producing shrinkage free castings and is based on the assumption that the metal is entirely free from dissolved gases, or in such condition that no gas will be evolved during solidification. It also is assumed that molding materials will be selected and used in such a manner that harmful gases will not be picked up by the molten metal and become dissolved therein during pouring.

An attempt will be made to select certain common, simple-shaped sections, describe methods of casting these sections without shrinkage, and cover how to join these simple shapes into castings with a certain amount of intricacy and which might be expected to introduce feeding difficulties.

Must Apply Gating Rules—A few hard and fast rules apply to solidification of metals. They must be applied to gating systems of specific castings if the desired results are to be obtained.

The most important of these rules is that no section, regardless of its size can be fed to complete soundness through a smaller section. The second rule, worked out in considerable detail at the Naval Research Laboratory, concerns the feeding range of risers.[2] Roughly this rule states that plate castings of a width to thickness ratio of 3 to 1 or greater can be made sound for a distance from the riser edge equal to about four and one-half times their thickness (4½ T). However, if a chill with the necessary heat capacity is used at the casting extremity, or between risers, the feeding distance is increased appreciably. Although the 4½ T rule was determined chiefly for steel castings, the author has found that for bronzes it is safer to assume a feeding distance of only 4 T. He also has found that effect of chills is more potent in the case of bronze than with steel, and results of those experiences will be used in the following discussion.

Certain cases will be mentioned later which may appear to be exceptions to the above rules. A little consideration will show that these really are ways of making them work to advantage where the design is such that the rules cannot be applied directly.

Basically, production of a sound casting is a comparatively simple matter if the necessary thought is given to design when the part is laid out. The majority of designs can be made without shrinkage when correct foundry techniques are used. Designs which are not amenable to soundness should be changed to permit the production of sound castings.

Designer Lacks Foundry Knowledge—In general the designer has little or no knowledge as to how the casting should be produced, but lays the part out

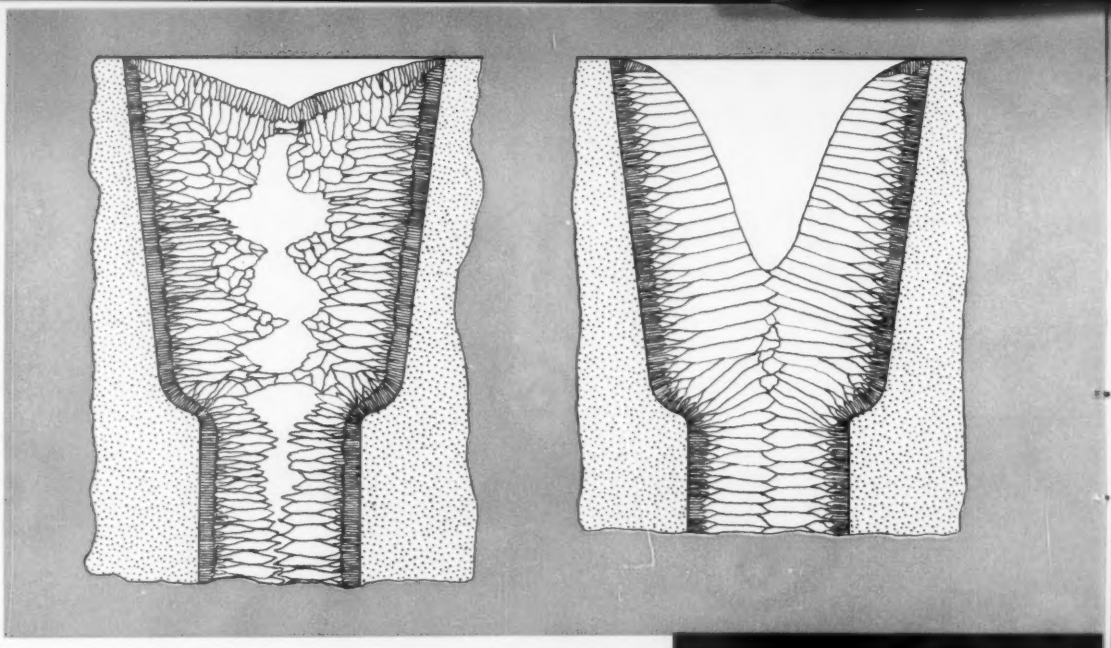

Fig. 2—Lack of feed because of premature freezing of riser surface causes secondary shrinkage

Fig. 3—Preventing freezing of metal at riser surface provides complete feeding of the casting

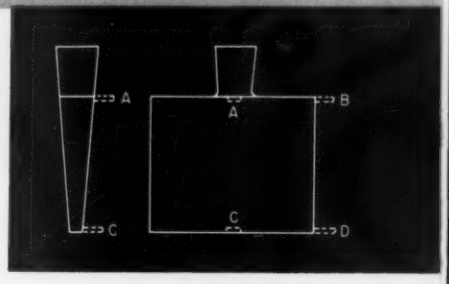

Fig. 4—Risering and gating for wedge-shaped casting molded in ideal position, with thicker edge uppermost

to best fit the intended use. Several different designs might be satisfactory, and one may be better and more economical for both the foundry and the user than any of the others. The foundryman should not hesitate to inform the buyer if the casting could be made better and cheaper if redesigned. By the same token, he should be given some idea of the engineering requirements which must be adhered to.

The buyer usually furnishes the pattern for a particular casting and often each foundry which undertakes its production has to alter the pattern to fit its particular techniques. The author contends a foundryman knows best how a pattern for a particular casting should be made. Therefore, one of three practices should be followed: 1. The foundry should build the pattern for a new job. 2. The foundryman should give detailed instructions to the buyer as to how the pattern should be built. 3. A commercial pattern shop should build the patterns but should consult with the foundryman and the designer.

The final pattern, especially if an intricate design, should not be built until the optimum method of molding has been determined. If a thorough study has been made of the design and the molding methods to be applied, there should be little or no need for "cut and try" operations. Until the correct foundry procedures have been worked out, first pattern should be built at the lowest practicable cost, and in such a manner and of such materials that it can be changed quickly and economically. Once the correct foundry procedures have been determined with complete certainty, a more expensive and permanent production pattern can be built.

Requirements of Sound Castings—The basic requirements for making a casting free from shrinkage can be expressed very simply. Complete directional solidification must be obtained throughout the casting, and complete feeding must be provided as long as any liquid metal remains in the mold cavity. To obtain directional solidification, freezing of the metal must begin at some point considerably removed from the risers. Then freezing must continue gradually and progressively along the casting, each bit of liquid metal feeding the adjacent metal which is solidifying.

Finally, the part of the casting last to freeze must be fed completely by suitable risers. It may be necessary to employ chills to initiate freezing in certain locations, and to use insulating pads in locations which otherwise would freeze too fast. Risers must be kept open to the atmosphere and to the liquid metal within the mold cavity until the casting itself is entirely solid. Since risers, even those considerably oversize, will feed only a limited distance, some means must be provided to insure that the casting feeds itself, especially if it is made up of extensive sections, thus leaving the risers to feed only the last portion of the casting. The gating system must be designed to allow the metal to enter the mold without picking up air or moisture, without turbulence, and to aid in setting up the desired temperature gradients.

Gating Technique—Tapered castings have been

selected to open the discussion on technique because they commonly occur in castings, and they lend themselves best to achieving complete directional solidification obtainable with the greatest variation in gating methods.

Probably the simplest tapered casting is that forming a section of a cone or pyramid, as in Fig. 1, which was suggested as a fracture test to determine the presence of gas in the molten metal.[1] Such a casting is best and most easily poured directly but slowly into the top of the riser which places the coldest metal at the bottom where freezing is initiated and progresses upward, the hottest metal being in the riser. Because of this hotter metal and because the cross section of the riser is greater than that of any point in the casting, metal in this riser should remain molten until the casting becomes entirely solid. The only difficulty which might be encountered would be rapid formation of a solid crust over the surface exposed to the air.

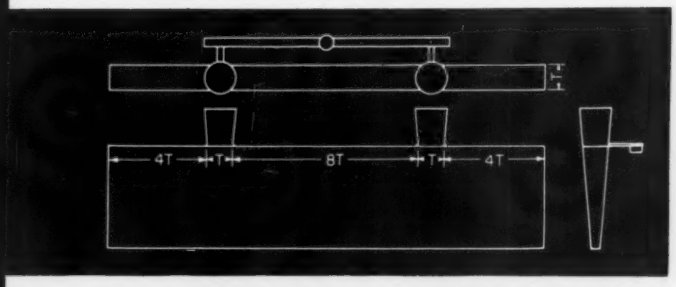

Fig. 5—Risers and gates needed for full feeding of "big end up" wedges requiring multiple risers

Should this impermeable skin form over the surface before the casting itself is completely frozen, atmospheric pressure would be excluded. The weight of the metal itself would not be sufficient to force molten metal from the riser into the unsolidified metal between the dendrites in the casting and secondary shrinkage might result as indicated in Fig. 2. Such shrinkage also can be caused by incorrect riser design which results in premature cutting off of final feeding. Riser design was discussed at length by the author a number of years ago but will be considered somewhat in this series.[3]

If the riser is surrounded by the same material as that in the mold, there will be the usual chilled skin, and then a layer of columnar crystals. If the cross section is sufficiently large, there will be the usual equiaxed interior. With an open riser, transfer of heat to the air will at first be slower than that to the mold material because conductivity of air is less than that of the molding material. As the temperature of the molding material rises, however, conduction through the mold will slow down, but because of convection currents in the air, the heat at the surface of the riser metal will be carried away. At some time during this cooling interval, solidification of the riser surface may become faster than in the part lying next to the mold, and may permit an impermeable crust to form over the riser surface. The problem is to prevent formation of this crust until the casting has solidified entirely.

How To Avoid Early Freezing—Premature freezing of riser surfaces can be prevented without the use of excessively large risers. The simplest way is by using an insulating powder on the surface of the molten metal as it is coming up in the riser. Dry powdered gypsum, fuller's earth, bentonite, or perlite usually will insulate sufficiently to achieve the desired end, but the material subsequently may affect the sand, as most of it will go into the shakeout. Certainly any large buildup of calcium sulfate from gypsum should be avoided if the sand subsequently may be used for making molds for high nickel alloys. With the exception of bentonite or other clay, the compounds mentioned would have little or no subsequent effect aside from weakening the bond due to dilution. Bentonite is a strong clay and could exert a serious after-effect by buildup of excessive strength in the sand.

Exothermic powder also can be used to prevent freeze-over. This is composed of material which, when placed on the surface of riser metal, begins to burn and to give up heat to the metal, thus not only keeping it in the molten condition, but also insulating it from the air without resisting the downward atmospheric pressure.

Fig. 3 indicates the type of shrinkage cavity in a riser which has been kept open to the atmosphere. This should be compared with that illustrated in Fig. 2. Both cavities have the same cross-sectional area. The type of shrinkage indicated in Fig. 2 usually indicates interdendritic shrinkage throughout the casting. The author has found that deep piping as shown in Fig. 3, not unusual with gas-free bronzes, indicates sound castings provided that foundry techniques permit complete feeding.

It should be mentioned that atmospheric blind risers, such as those of the Williams type, do not require any special treatment to prevent their freezing over. Unfortunately, such blind risers have but limited application with most nonferrous metals. This limitation was explained by the author in an earlier series and will be touched upon in discussing Fig. 8.[3]

For several reasons, every effort should be made to mold wedge-shaped castings, big end up, with the riser on top. In general, best results are obtained by pouring them directly into the riser or through a gate or series of gates at the extreme top of the casting. Fig. 4 shows a wedge molded in the ideal position with the thicker edge uppermost. For this casting a single round tapered riser is shown with a wedge having a slight taper. It would be better to flare the riser somewhat at the point where it leaves the casting as indicated in Fig. 1.

Riser Junction Is Important—Care must be taken that the junction of the riser with the casting is not smaller than the maximum thickness of the casting top, otherwise it will not be possible to obtain complete feeding. Of course, the riser could be extended over the whole casting, but this would waste metal without offering any feeding advantage. To obtain the most advantageous temperature gradients in the molten metal, the casting should be poured slowly

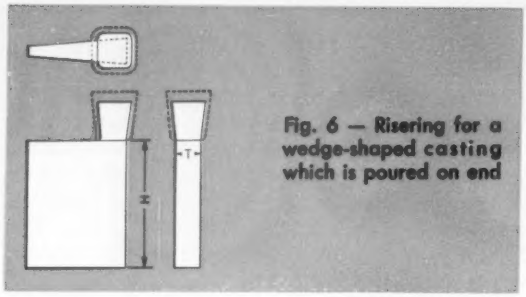

Fig. 6 — Risering for a wedge-shaped casting which is poured on end

and directly into the riser. Care should be taken that the sand in the mold is capable of permitting impact of the metal stream without dislodgement of the mold particles.

To digress a moment, the author has talked with some foundrymen who would not permit metal to fall in a mold as must necessarily be the case with top pouring. Just how is this dropping to be prevented even with a horn gate except by using a vacuum or other system whereby the ladle is placed under the mold and the molten metal drawn or pushed upward? The advantages to be gained from top pouring will more than offset any increased cost resulting from the use of a molding material which will resist impact of the metal stream.

Returning to the discussion of risers, the one shown in Fig. 4 can be placed at any point on the edge of the casting as long as the particular point is at the widest part if the edge is of non-uniform thickness, and as long as the distance from the end of the casting to the adjacent side of the riser where it joins the casting does not exceed four times the top thickness of the casting.

As mentioned, the best way to obtain correct temperature gradients is to pour the casting through the riser. This is not always feasible, however, and it may be necessary to resort to gates. With the setup shown in Fig. 4, the best gating would be that indicated at *A*, as this location would put the feeding metal directly into the riser. Second choice would be as shown at *B*. With the in-gate at a distance from the riser it would be well to increase the size of the riser to allow for the slight cooling of the metal before it enters the riser.

When using top pouring, either through the riser or through gates *A* or *B*, the metal should be poured as slowly as practicable. As the casting section becomes thinner or the taper becomes less, pouring should become correspondingly slower. A general rule would be that top pouring should always be slow to aid in setting up the desired temperature differentials.

There may be cases where top pouring would be impossible or impracticable and bottom pouring must be used as indicated by gates *C* or *D*. With such bottom gating, slow pouring might prevent setting up the correct temperature gradients and might offset advantages of the wedge shape. Under such conditions, the mold should be filled as rapidly as possible so that temperature of the molten metal will be practically the same throughout the casting and riser. Varying rates of cooling resulting from the cross-sectional changes in the taper then will produce the desired temperature differentials within the mold and the riser.

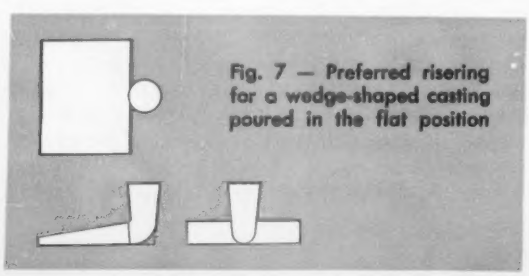

Fig. 7 — Preferred risering for a wedge-shaped casting poured in the flat position

Pouring Multiple Risers—Fig. 5 shows a wedge-shaped casting which is too long to be fed from a single riser. The dimensions given on the side or front view indicate the maximum permissible riser spacing which will provide soundness at the top. If the top edge is completely fed, the lower portions of the casting will be fed automatically by this heavier upper portion.

As stated earlier, a correctly designed riser can be counted upon to feed horizontally a distance not greater than four times the thickness of the casting at the top. A single riser will feed this distance in each direction and a spacing of not more than eight times the thickness can be permitted between two adjacent risers. If the casting is longer than indicated, additional risers must be provided to maintain the proper spacing between adjacent risers. The casting should be fed into the bottom of the risers through a common runner designed for uniform distribution of metal into the gates. The runner preferably is fed from a single down sprue. It should be apparent that, with correct riser spacing, this method also should be suitable for a ring or a cylinder having a tapered cross section.

When the wedge forms a part of an intricate casting, it is not always possible or desirable to position the wedge part with the big end up. It will be necessary, therefore, to consider means of casting such shapes in other positions. Fig. 6 shows the wedge molded and poured standing on one of the ends. This is one of the cases where a square riser is recommended. It is attached to the top end at the widest portion of the casting as indicated by the solid lines in the sketch. Here again, the surest results will be obtained by pouring slowly.

When a gate is necessary, it should enter the bottom of the riser. The rate of metal flow can be metered by controlling the size of the gate and keeping the down sprue filled. If it is necessary to gate into the bottom or some position in the casting other than the top, pouring rate must be increased and the riser must be enlarged somewhat as indicated by the dotted lines. If the height *H* is more than six times the thickness *T* of the heavy edge of the wedge, obtaining an absolutely shrinkage free casting will be difficult except by very slow pouring through the riser or through a top sprue.

It will be noted that the riser shown in Fig. 6 follows the contour of the casting at the juncture, the corners being gradually rounded off as the cope surface is approached. If a round riser were used, its diameter would have to be at least as great as the maximum thickness of the wedge. A certain amount of padding of the casting would be necessary to accomplish this. A round riser having a diameter less than the thickest part of the wedge

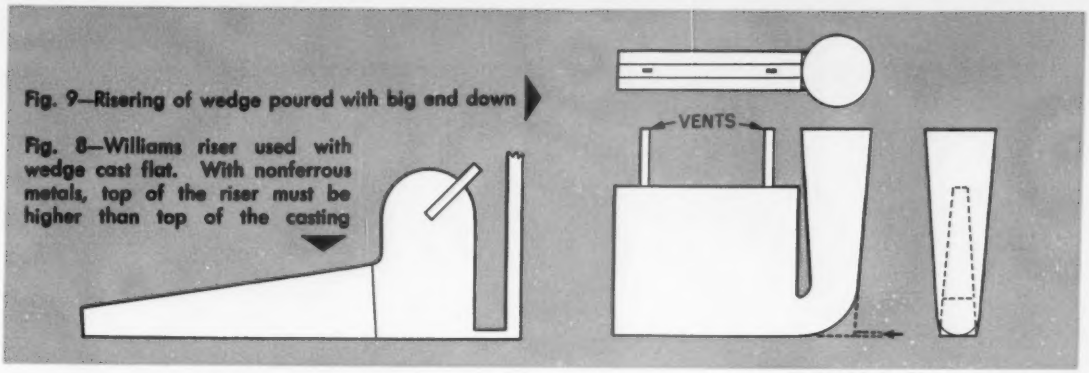

Fig. 9—Risering of wedge poured with big end down

Fig. 8—Williams riser used with wedge cast flat. With nonferrous metals, top of the riser must be higher than top of the casting

would not be able to feed the casting completely.

Other Gating Arrangements—When the wedge is part of a more intricate casting, placing risers and gates as described may not be possible and other placements may be necessary as well as adding padding to obtain the required directional solidification. It would be impossible to detail every placement and the foundryman must determine the best and most economical riser design, keeping in mind the rules applying to the solidification of metal.

The third position in which the wedge might have to be cast would be in the flat. It will be seen from Fig. 7 that the casting and the riser indicated by the solid lines is really the same as the one shown in Fig. 4 except that the riser has been "bent around" in an angle slightly less than 90 degrees. The author prefers use of a tapered riser. This is accomplished easily when the riser is vertical but introduces certain molding difficulties and somewhat greater cost in the present case. Probably the riser could be simplified by molding it as indicated by the dotted line and still feed satisfactorily.

This is one of the few cases where a blind riser of the Williams type should work satisfactorily when casting bronze. As explained by the author, the Williams riser principle of feeding is applicable to most nonferrous metals only if the molten metal in the riser is at a higher level than that in the casting.[3] This method is practical as shown in Fig. 8 but may be limited to those cases where a comparatively thin casting is molded and poured in the flat position. If the wedge is part of a casting which extends to a considerably higher level, the use of the blind riser may not be practical or may be less economical than an open riser. However, some of these cases will be considered subsequently when discussing the making of intricate castings.

In placing a "fire cracker" core when casting nonferrous alloys, the inner end of this core should extend to the middle of the blind riser to take full advantage of the molten metal at the center. This is not necessary when casting steel as this metal solidifies with a slowly advancing front as opposed to the rapid front advance encountered in the freezing of tin-bronzes.

Before leaving the subject of wedges, consideration must be given to the "big end down" position. There are cases where such positioning cannot be avoided. As shown in Fig. 9 adequate risering can be obtained only by attaching the riser neck to the heaviest section which is at the bottom. To provide feeding, the riser neck must be as large as the casting at the junction and then must become progressively larger as it rises to the cope surface. This results in a very heavy riser, often heavier than the casting.

Pouring would best be directly down the riser, but may, if necessary, be accomplished by a gate leading into the bottom of the riser. In the case of a long casting where a single riser would not feed, additional risers, all entering the lower edge, are necessary.

Other riser placements may be used where the design requires, such as leading the riser neck into the underside of the casting (utilizing a horn type gate) or even into the lowest point on the face of the casting. In any of these alternate methods, the riser must become progressively larger as it passes from the junction up to the cope surface. Needless to say, these alternate methods will require more metal than the one indicated. Risers never should be placed on top, the thin edge in this case, of the casting. Such top risers would fail to feed and might increase the shrinkage.

It would be well to vent the top of "big end down" wedge castings as the mold gases and contained air might have some difficulty in passing through the sand at the narrow top edge. As stated earlier, this positioning should not be used if it can be avoided without having a deleterious effect upon other parts of the casting.

There will, of course, be other positions in which the wedge section will be incorporated into castings, but the risering and gating methods described here should be adaptable to most cases.

The wedge or other tapered section is the one which nearly always can be fed completely. For this reason it should be the most popular from the standpoint of soundness. Padding of castings is merely the provision of tapers to sections which otherwise are not amenable to soundness, and in this sense is one of the most useful and valuable tools which the foundryman has at his disposal.

(To be continued)

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The Case Against The Tension Test

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SUPPOSE, for the moment, that nothing is known about tension testing and that we wish to know the ability of a metal to withstand a uniform tensile load. What is more logical than to take a uniform section, either round, square, or rectangular, and load it in some type of apparatus that will produce tensile stress? What happens? The test specimen almost invariably breaks in the grips. It makes no difference if the grips are wedge-shaped, threaded, or of some other design. Headed specimens are ruled out for they are not uniform sections. This point is recognized by almost everyone intimately connected with testing. It is so basic that it seems taken for granted and its fundamental importance overlooked.

If we are to establish an understanding of the ability of a metal to withstand a uniform tensile load, these seeming details become of prime importance. First, it is impossible to impose a tensile load without holding the part. Proof? There is none. Try to imagine loading any normal part in space without some connection between the part and the load. The very imposition of grips on our supposedly simple test specimen introduces complex loading to a point that overshadows the load we are attempting to measure. This is important in every evaluation of service failure. Take the case of failures of suspension bridge cables cited in the previous article. The cables failed where they were wrapped around the holding stanchions. These stanchions correspond to the grips of the tension test, and most uniform tension specimens fail in the grips. The load was not simple tension, but complex, mostly transverse. A microscopically rough surface caused stress concentration, with the surface becoming the controlling factor in the failures.

Specimen Shape Is Important—The very shape of the tension specimen, with ends purposely enlarged to prevent failure in these areas, defeats the purpose of the test in evaluating service performance of the metal. The following points make the test nonrepresentative: The act of shaping the specimen removes the surface metal. This metal almost invariably is the most highly stressed in service. Condition of the surface and the surface metal are the prime factors effecting fatigue strength and resistance to notch brittle fracture, the causes of over 90 per cent of all service failures.

Shaping of the test specimen also results in a nonuniform specimen. It seems to have been forgotten that specimen shape, specifically gage length of the tension test specimen, profoundly affects mechanical properties of the metal, even in pure tension.[1,2]

Fig. 1 shows the effect of decreasing gage length on tensile properties of similar cast and wrought steels. The same effects, differing only slightly in degree, apply to all metals regardless of how formed. The rapid decrease in elongation and reduction of area is not surprising. What is surprising is the appreciable increase in yield and tensile strengths as gage length is decreased. There is no catch to the data in Fig. 1; it is representative. The particular relations shown were elected from hundreds of similar relations for three reasons. First, Fig. 1 compares cast and wrought steels of similar composition, compares them with two heat treatments: Annealing resulted in a microstructure with a high ductile-brittle transition temperature; the oil quenched steels are notch-tough down to —50° F. Little if any difference shows up in the tensile properties of the wrought cast specimens similarly heat treated except when the specimens are sharply notched. However, the drop-off in strengths still leaves the sharply notched steels with strengths equal, or better than those exhibited by the standard specimens with 2-in. gage lengths.

An Accident Points the Way—The third reason for showing these steels was an accident that brought this investigation to a screeching halt and

In a previous article under the same title (FOUNDRY, November 1957) the author presented his case against the tension test for evaluating the strength of cast parts. He attempted to eliminate old concepts concerning strength and form a basis for new concepts. In this second article, he presents ideas on which he hopes a new and better understanding of casting strength and serviceability can be built.

made the writer a heretic as far as tension testing is concerned. The tests with results shown in Fig. 1 were made at room temperature. When nothing spectacular showed up as far as notch brittleness was concerned, the testing was extended to temperatures down to −100° F. A notch-brittle annealed steel specimen like D1 of Fig. 1 slipped from the tongs as it was lifted from the dry ice-acetone bath and fell about 2 ft to a concrete floor. It broke like glass. If a notch and the imposition of a minor complex load can cause metal to break due to its own weight when the same metal will withstand a load of over 10 tons when slowly and axially applied, does not the notch (the shape of the specimen) and the method of loading overshadow any tensile property? It will be noted from Fig. 1 that the notched Charpy results follow and predict the metal's behavior in this respect.

The same objections regarding removal of surface metal and shape of specimen are even more pertinent in evaluating the more important fatigue properties of metals. It is agreed in the engineering profession that over 90 per cent of service failures are due to fatigue. Because resistance to fatigue of a given part depends primarily on stress concentration and stress concentration depends primarily on shape and surface, these two factors must be considered. Unfortunately these factors are not considered in the so-called fatigue strengths listed in most handbooks. The handbook fatigue strengths are derived from a specimen as shown in Fig. 2. The radius of this specimen is never even approached in practice, and the surface is polished *longitudinally*. Shape of the specimen was derived from the same reasons establishing the shape of the tension specimen, mostly a desire for consistent results and especially to prevent failure in the grips. Therefore, this specimen does not evaluate shape or surface.

Handbooks Are Misleading — The foundryman

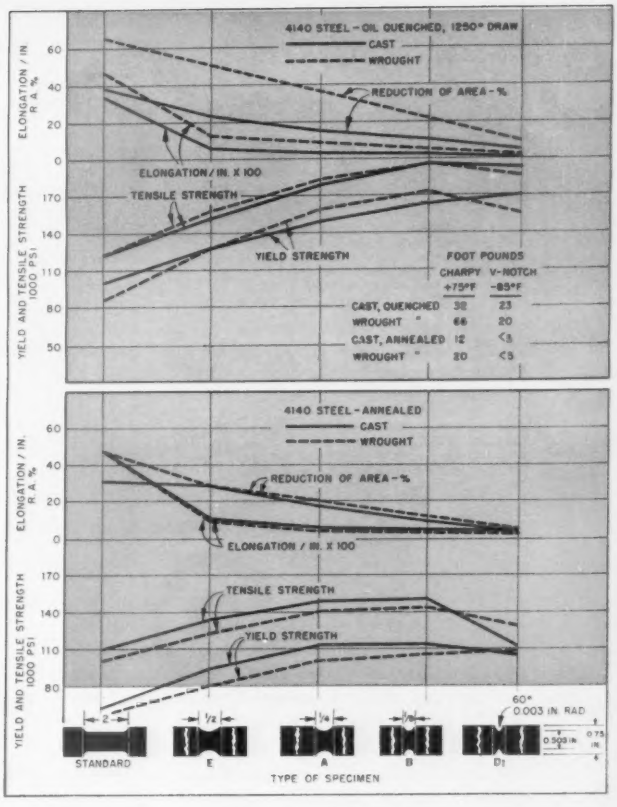


Fig. 1—Effect of decreasing gage length on tensile properties of similar cast and wrought steels. The same effects apply to all metals

should be interested in these details, for they have, again, undervaluated cast metal. Take steel as an example. The handbooks give a tensile strength-fatigue strength ratio of 50 per cent for wrought steel. For cast steel the ratio usually is given as 45 per cent. The recent findings of Evans, Ebert, and Briggs[3] confirm these ratios for the test specimen of Fig. 2. These same investigators find that when the surface is changed slightly to a smooth lathe finish (no fancy polish) the fatigue strengths of the two steels are the same, as listed in Table I. When the shape is changed to impose stress concentration such as present in actual parts, the fatigue strength is lowered, but by the same degree for both cast and wrought steel, also as listed in Table I.

Many parts in service are subject to fatigue stress applied to unmachined surfaces. This point also has been studied to a limited extent by Evans, Ebert, and Briggs, and the results are included in Table I. These few tests show that an unmachined cast surface has slightly higher fatigue strength than unmachined forged and rolled steel, but many more tests are needed to establish, or disprove this point. Unfortunately, these points are not mentioned in the handbooks. They all show cast steel to be slightly inferior to wrought steel. Here is a selling job for the foundryman. But before he

TABLE I—Fatigue-Tensile Strength Ratios for Cast and Wrought Steels[3]

Test Specimen and Surface	Fatigue Strength % of Tensile Strength — Cast Steel	— Wrought Steel* — Long.	Trans.	Remarks
Standard specimen, 9⅞ inch radius, polished surface, annealed carbon steel 1¼ inch sections	40%	48%	37–45%	Hardness range 149-375 Brinell. Note that the fatigue-tensile ratios are higher for the harder steels
Same specimen, surface, and section, but normalized carbon and alloy steels	40–50%	48–60%	37–45%	
Same specimen, surface, and section, but liquid quenched and tempered alloy steel	42–48%	55–59%	*	
Same specimen and surface, but 3 inch section, normalized carbon steel	49%	52%	44%	
Same specimen and surface, but 6 inch section, quenched 8635 steel	Surface—48–55% Center —40–43%	.....	.....	
Standard specimen, smooth lathe-turned surface, 125-250 microinch finish	45%	46%	.....	Based on a limited number of tests
Sharp machined notch, under 100,000 psi ten str	30–32%	30–32%	.....	Note that the effect of hardness is reversed from that of the unnotched specimens. Now, the harder steels show lower fatigue - tensile strength ratios
Sharp machined notch, 100,000 psi ten str	27–31%	27–31%	.....	
Cast surface, 8640 steel, 109,000 psi ten str, sound section	32%	.....	.....	Based on a limited number of tests
Cast surface, 8640 steel, 109,000 psi ten str, section with centerline shrinkage	32%	.....	.....	

*Cast steel does not show directional properties, so only one value is required. Both the longitudinal and transverse properties are required to evaluate wrought steels.

can sell the facts he must establish them. This cannot be done by repetitious tension testing.

The foundryman needs to sell himself first. The reported differences in fatigue strength of unmachined cast and wrought shapes probably have nothing to do with the metal itself, but are due to the condition of the surfaces. It has been known for years that accurately controlled shot peening appreciably increases fatigue strength. The foundry industry shot blasts castings to clean them. Does this shot blasting account for the reported increased fatigue strength of cast surfaces? It cannot be assumed that uncontrolled shot blasting automatically increases the fatigue strength of a casting. To the contrary, there is some evidence that fatigue strength can be decreased by shot blasting.[4] Nevertheless, there is the intriguing possibility that controlled shot blasting can clean the casting and at the same time increase fatigue strength 25 to 50 per cent by imposing compressive stresses in the surface metal. If just a fraction of the time and money the foundryman now spends on repetitive tension testing would be spent on this phase of testing, the designer would have data to more precisely design cast parts, and the foundryman would have some of the best sales material possible—facts regarding the casting that is to be used, not the test bar that is thrown away.

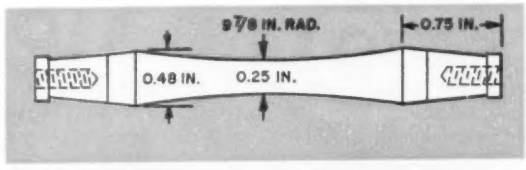


Fig. 2—One type of standard fatigue specimen. The ends differ as shown to fit testing machine

TABLE II—Fatigue-Tensile Strength Ratios for Sand Cast 355T6 Aluminum Alloy[5]

32,000 psi Ten Str, 20,000 psi Yld Str

Test Specimen and Surface	Fatigue Strength 1 Million Cycles	% of Tensile Strength 100 Million Cycles
Standard specimen, 9⅞ inch radius, polished surface	33–47%	22–31%
Same with microshrinkage	47–50%	31%
Sharp machined notch, 60°, 0.001 inch radius	13–47%	13–31%
Plate castings, as-cast surface	28–41%	19–24%
Plate castings, machined surface	27–41%	19–24%
Plate castings with dross and sand defects	28–31%	19%
Plate castings with defects repaired by welding	22–31%	19–25%
Plate castings with 1 to 1 1/16 inch dia cored or drilled hole	25%	19%

Defects Affect Fatigue Strength—Fatigue strength, or more properly, resistance to fatigue fracture depends primarily on stress concentration. Any defect is a potential stress raiser, but the accent must be placed on potential. A study of defects and their effect on fatigue strength is a necessary part of casting sales, for a major part of this sales effort in the immediate future must be aimed at increasing the designer's confidence in cast parts. Evans, Ebert, and Briggs[3] have touched on this phase for steel castings with encouraging results. They have shown that centerline shrinkage in uniform cast steel sections has little effect on the section's resistance to fatigue failure, as shown in Table I. This is just a start. Confirmation is needed. The effect of removal of surface metal by machining to simulate machined castings and the effect of irregularity of cast shapes must be studied and sold before the designer will accept the data as representative for steel castings.

Holt, Smith, Stickley, and Miller[5,6,7] have made an even more thorough study of cast aluminum shapes and the effect of loading, surface condition, and common cast defects on fatigue strength. Their results confirm those of Evans, Ebert, and Briggs

on steel and are quite encouraging. As shown in Tables II and III, none of the defects that might be present in aluminum castings, past the point of rejection by normal nondestructive inspection, appreciably effect the metal's resistance to fatigue fracture.

The references must be consulted if Tables II and III are to be used for anything but a simple comparison with tensile properties. Fatigue strength is influenced not only by the metal, the shape and surface of the part, but also by the loading. Ferrous metals, particularly steel, show curves for the relationship between load (stress) and the number of load applications (SN curves) that become horizontal between 1 million and 10 million cycles of load application. Therefore, specimens that do not fail at this point can be expected to withstand that particular load indefinitely. Nonferrous alloys, particularly aluminum and magnesium, do not behave in quite the same manner. Their SN curves do not become horizontal at 1 to 10 million cycles and many more cycles are required to establish their ultimate fatigue strength. Fortunately, in service peak loads usually establish the maximum load in fatigue and most times it is improbable that 1 million peak loads will occur during the life of the part. However, Tables II and III list fatigue strengths at 1 million, 100 million, and 500 million load applications. Take your pick.

Just what type of load and how it is applied also are major factors in fatigue. This phase has been studied for die cast aluminum by Stickley and Miller.[7] The subject is much too specialized for a general discussion such as this. The references, especially reference seven, should be studied by anyone interested in design.

Need Data on All Metals—These four studies on steel and aluminum are a start on the understanding of fatigue resistance of cast shapes other than the ideal fatigue specimen. In the writer's opinion similar information urgently is needed for the other cast metals, particularly gray iron. It is known from standard fatigue tests that gray iron is relatively insensitive to notches. Does this notch insensitivity extend to defects, particularly to surfaces rougher than those of the ultra polished standard fatigue specimen? It is probable that it does, but the designer cannot design on probability. He needs quantitative data and furnishing such data will sell gray iron.

Increasing the fatigue strength of metal is difficult and expensive, but strength of the part easily can be doubled by designing to eliminate stress concentration. The preceding tables emphasize this point. Note in Table III that a diecast aluminum bracket broke in fatigue at a stress about 20 per cent of the metal's tensile strength. In design parlance this means that a safety factor of five (based on tensile strength) is needed to cover this one phase of service strength. Table III also shows that the same metal with the same surface will withstand over 500 million load applications of slightly less than half the tensile strength if the radius of the fillets is increased to 9⅞ in. A change from a notch to an over-generous radius has more than doubled service strength of the part. Radiuses exactly 9⅞ in. are not needed to accomplish this increase, but radiuses measured in inches rather than fractions of an inch are needed. What forming method other than casting can easily form these large radiuses?

An example of how silly present specification and inspection have become can be read from Table II. Note that a 1-in.-diam hole decreased the fatigue strength of this 380 diecasting aluminum alloy just as much as the worst casting defect. How many times have castings been rejected because of a small defect and then a hole drilled right through the same area of perfect castings? When holes are required in cast parts fatigue strength of the castings can be increased by rounding the edges of the hole. If the hole is cast in, the edges can be rounded by making the core prints larger and casting the rounded corners in the core. In any other forming

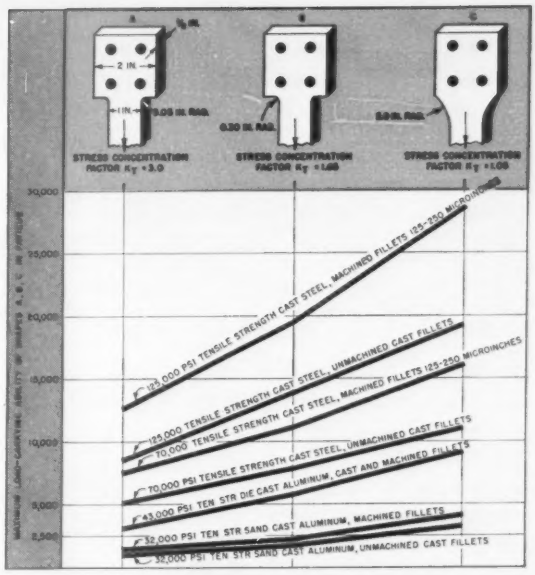

2 IN.
1 IN.
0.05 IN. RAD.
0.20 IN. RAD.
STRESS CONCENTRATION FACTOR Kt = 3.0
STRESS CONCENTRATION FACTOR Kt = 1.45
STRESS CONCENTRATION FACTOR Kt = 1.05
30,000
25,000
20,000
15,000
10,000
5,000
125,000 PSI TENSILE STRENGTH CAST STEEL, MACHINED FILLETS 125-250 MICROINCHES
125,000 TENSILE STRENGTH CAST STEEL, UNMACHINED CAST FILLETS
70,000 TENSILE STRENGTH CAST STEEL, MACHINED FILLETS 125-250 MICROINCHES
70,000 PSI TENSILE STRENGTH CAST STEEL, UNMACHINED CAST FILLETS
43,000 PSI TEN. STR DIE CAST ALUMINUM, CAST AND MACHINED FILLETS
32,000 PSI TEN STR SAND CAST ALUMINUM, MACHINED FILLETS
32,000 PSI TEN STR SAND CAST ALUMINUM, UNMACHINED CAST FILLETS

Fig. 3—Average load-carrying ability of three junctions stressed in fatigue; section, ½ sq in. Strengths for aluminum castings based on equivalent areas. This ratio is misleading if equivalent weight of the part is the comparison. To compare an equivalent weight, one must multiply the aluminum strengths by three

TABLE III—Fatigue-Tensile Strength Ratios for Die Cast 380 Aluminum Alloy[6]

43,000 psi Ten Str, 26,000 psi Yld Str

Test Specimen and Surface	Fatigue Strength 1 Million Cycles	% of Tensile Strength 500 Million Cycles
Standard specimen, 9⅞ inch radius, polished surface. (Six alloys)	.....	44–51%
Sharp machined notch	16–23%	16–21%
Sharp cast notch	16–23%	12–21%
9⅞ inch radius, cast surface	46–56%	44–51%
9⅞ inch radius, 0.010 inch metal removed by machining	51%	44%
9⅞ inch radius, 0.025 inch metal removed by machining	44%	44%
Cast bracket	.....	21%*

*Broke after 5 million cycles at a sharp notch imposed by design.

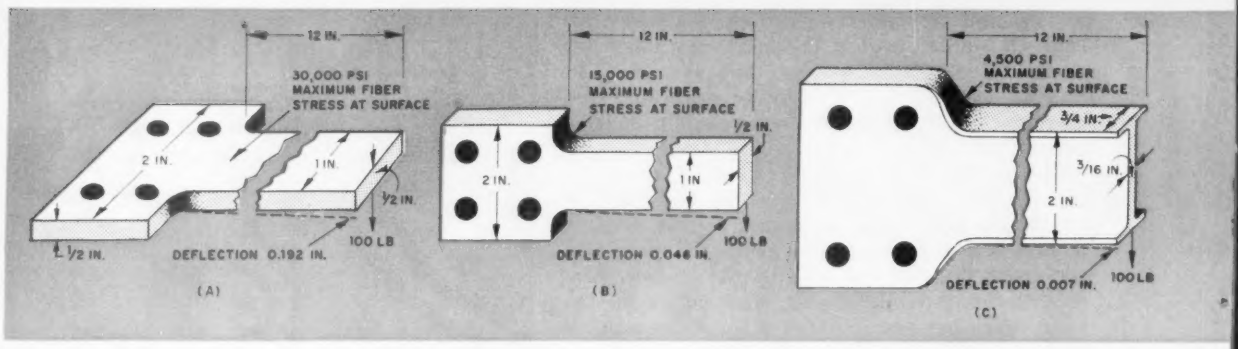


Fig. 4—Drawings illustrate the effects of various designs on the load-carrying ability of a cantilever beam

process the rounding of edges requires a separate, expensive chamfering operation.

Streamlining Offers Sales Opportunities—The opportunities to sell castings from the standpoint of such streamline design are great. Streamlining produces a part with appreciably higher service strength and one that is simpler, cheaper, and more foolproof to cast. The designer should be interested in areas of high stress concentration. The foundryman (although he may not know it) is interested in the same areas because of strain concentration in the sense that contraction during cooling from the liquid state is concentrated in these areas. In most cases the areas that cause trouble in the foundry due to shrinkage defects are those that cause trouble in service due to stress concentration.

Decrease in stress and strain concentration can be accomplished simply by streamlining the part—blending sections together with the largest possible radius, using rounded rather than square corners, applying half U junctions in place of sharp L junctions, enlarging radiuses at all T junctions, and substituting simplified T junctions for X and K junctions. Castings so designed and cast correctly have the advantage over shapes formed in any other way.

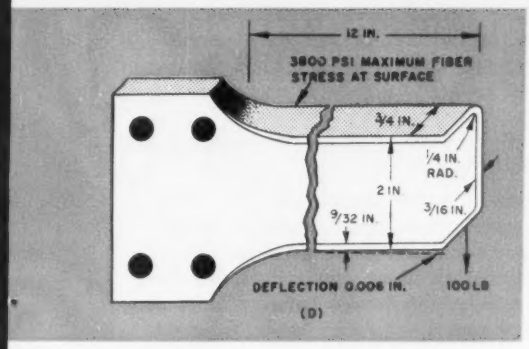
There is only one catch, this streamlining cannot be generalized into a few simple rules. Each part, or at least each group of similar parts, must be treated individually. Consider a simple junction of sections of unequal size as shown in Fig. 3. Four cast metals are studied, soft steel with a tensile and yield strength of 70,000 and 36,000 psi formed by casting, quenched and tempered alloy cast steel with tensile and yield strengths of 125,000 and 100,000 psi, diecast aluminum, 43,000 psi tensile strength, 26,000 psi yield strength, and sand cast aluminum, 32,000 psi tensile strength, 20,000 psi yield strength. It is evident that more than handbook values derived from the ideal standard fatigue specimen are needed.

Ability to Carry Load—The type of loading, shape, size, and surface of the part are major factors in its load-carrying ability. A range of values should be given in Fig. 3. The lines shown are averages and are shown instead of ranges for clarity of presentation. The increase in load carrying ability of castings by simply increasing the radius of the fillet is quite significant and overshadows all other variables. If there is any dynamic loading (vibration is enough) an increase in fillet radius from about 1/16 in. to 2 in. increases the load carrying ability of this part 100 to 300 per cent. Starting with a more generous radius of about ¼ in. the increase in service strength due to a larger 2-in.-radius fillet averages 50 per cent. Such an increase looms even larger when compared with present day quibbling about a few thousand pounds difference in test bar yield and tensile strengths.

It is noteworthy that in all metals shown the load-carrying ability in fatigue of the 2-in.-radius fillet with a cast surface is equal to or greater than a machined and polished normal fillet with about ¼-in. radius. This is important, for it affects the pocketbook. It is not necessary to run time consuming fatigue tests on each shape and size casting after basic fatigue properties of the metal are known. The science of stress analysis can be used to obtain usable design data. Stress concentration factors (K values) are available for many shapes, stressed by many types of loading.[8, 9] These values can be used as multiplying factors to calculate maximum load at areas of stress concentration. In fatigue, the experimentally determined fatigue strengths for unnotched specimens can be divided by the appropriate stress concentration factor to arrive at the safe fatigue load with no factor of safety for other variables. These theoretical working loads may be checked on the actual part by brittle lacquer or strain gages, another phase of stress analysis, to arrive at definite values for the load-carrying ability of the part.

Other Properties Are Important—When load is changed from tension to transverse, as in Fig. 4, properties strange to the foundryman determine the load-carrying ability of the part. Section modulus, moment of inertia, and modulus of elasticity determine stiffness and deflection. Only after these properties have been determined and the part designed to meet these properties does strength enter the picture. Now shear strength is important, not tensile strength.

Section modulus and moment of inertia are design factors. These terms determine, quantitatively,



just where to put the metal to obtain the greatest load-carrying capacity per pound of metal. The foundryman is in the unique position of being most able to put the metal where it will do the most good.

When the same junction of sections as shown in Fig. 3 is loaded transversely as in Fig. 4, a load of just 100 lb at the end of the 12-in. unsupported length causes so much deflection (about 1/4 in.) that the part is no longer a load carrying member, but a spring, and a poor spring at that. The deflection is calculated for steel, the stiffest of all common structural metals. For other common metals the deflection will be up to four times greater. The important point is that the load is only 100 lb. Does this not make quibbling about a few thousand pounds at levels of 20,000 to 150,000 psi seem silly?

An almost instinctive change is one of design. Rotate the part 90 degrees, as in Fig. 4b. The deflection is still too great for most designs, about 1/16 in. The next step, Fig. 4c, is also almost instinctive, but now it becomes necessary to evaluate the change. The I-beam section of Fig. 4c places metal where it will do the most good per pound and deflection has been decreased 85 per cent with no increase in weight. This is the reason why I-beam sections are so popular with the designer. However, the I-beam section was designed for hot rolling, not for casting. The two T-junctions are far from being tops in castability.

The channel section of Fig. 4d is one possible cast shape. It is streamlined, with large radiuses, is stiffer and stronger than I-beam sections of equivalent weight. The streamlining decreases stress concentration in service to almost zero and decreases strain concentration in the foundry almost as much. It requires no cores if designed for proper positioning in the mold.

What Happened to Strength?—It got lost in the scuffle. Design Fig. 4a must be made of high quality spring steel with a yield strength of over 60,000 psi to hold up. The maximum fiber stress with this design, imposed by a load of 100 lb, is about 30,000 psi. The maximum fiber stress of design Fig. 4d is under 4000 psi. Design has decreased by seven and one-half times the strength required for a given load.

Applications of the design shown by Fig. 4 do not stop at this particular shape, but can be applied generally. Take highway truck and trailer wheels for example. There are two general classes. The disc type that corresponds to Fig. 4a and 4b and the spoke type that is not a true spoke but a series of connected channel sections like Fig. 4d. The disc wheel almost always is used on smaller trucks, the channel type on the larger, heavy duty trucks. The reason is obvious. The channel design is many times stronger for the same weight. Need it be said that the disc wheel is hot pressed, the channel design spoke wheel is cast? The design of these wheels is as great a contribution to founding as any contribution on sand, molding, heading, and gating.

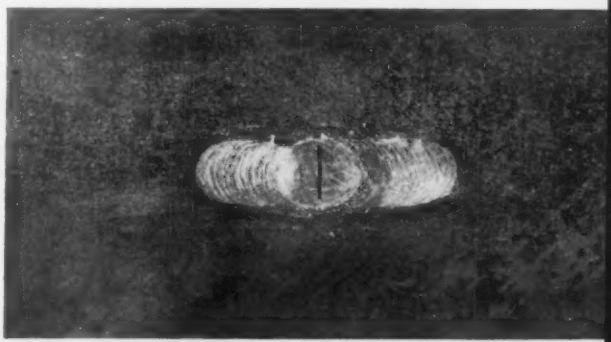
Need New Specifications—If the routine tension test is to be relegated to its proper position of control of the melting process, what specifications and inspection procedures should be used in its place to determine load-carrying ability of a cast part? Here are a few, in order of importance:

1. Shape—a design factor that should enter specifications, but is fixed as far as inspection in concerned.
2. Modulus of Elasticity—a selection and design factor, except for gray iron. The modulus is invariant for other metals and presents no inspection problems.
3. Stress Concentration—a factor in design, specification, and inspection. The inspection phase is solely for defects.
4. Tensile and Yield Strength.
5. Resistance to brittle fracture of metals other than gray iron, austenitic steel, and most, but not all, aluminum alloys.

Shape does not now enter into what is considered normal specification and inspection. There is evidence that it should. The foundryman and designer should not be at odds on this subject but in agreement. Any change that corrects a foundry problem of strain concentration will decrease stress concentration in service.

Stress concentration becomes increasingly important when design is streamlined and based on the lower stress concentration due to streamlining. Improperly directed and located crack-like defects reconcentrate the stress and can become dangerous. Specification and inspection must deal with the

Fig. 5—Drop weight specimen with crack-starting brittle weld. Photo by Naval Research Laboratory



actual parts; test specimens are useless. Intelligent use of nondestructive testing methods such as magnetic particle and penetrant dye inspection will satisfy inspection needs for most castings. Radiography can be restricted to pressure-containing parts. If a defect does not show up on magnetic particle or penetrant dye inspection, it almost certainly will not cause enough stress concentration to lower service life or strength.

Tensile and yield strength are needed in design and therefore must be controlled. Does a single, small test specimen cast with a lot of castings weighing tons represent these castings? No! Mass of the part, if nothing else, makes any attempted correlation nonsensical. Present specifications recognize this fact in part. Many steel casting specifications allow a different heat treatment for the castings and test bars to compensate for the effect of mass during heat treatment. However, no specification today allows for the effect of mass during solidification of the casting. If the specification is to be at all specific the part, or casting itself must be tested. If practical, proof testing under simulated service loads is ideal. Such testing can be applied to many more parts than is being done today, but it has limitations.

Cutting tension specimens from castings is satisfactory if the sampling is done properly and test results interpreted correctly. But the lathe operator invariably machines the specimen from the center of the section, machining off the outer metal that is the more highly stressed in service. This specimen is nonrepresentative and can be compared with nothing! The only method of correct sampling is to test the section, or junction of sections as wholes. If the specimens are so large as to exceed the capacity of the test apparatus a series of specimens are needed to represent all parts of the section. Such a procedure quickly becomes so expensive that it cannot be used for control purposes.

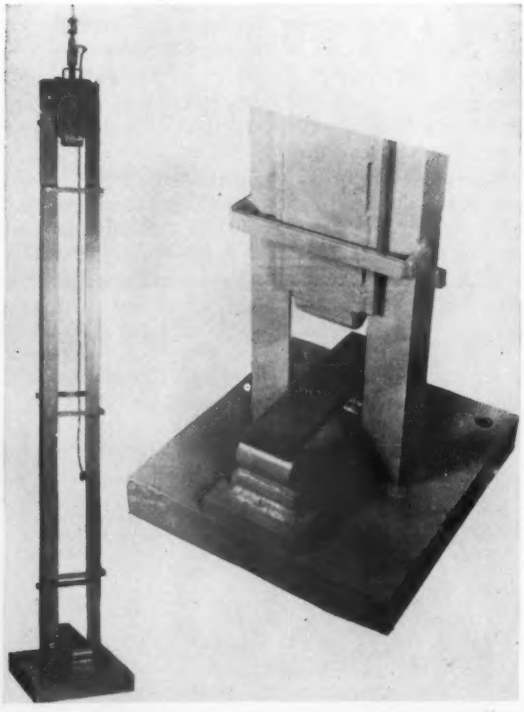


Fig. 6—Drop weight test equipment showing specimen in position. Naval Research Laboratory photo

Hardness Tests Give the Answer—Brinell, Rockwell, or other hardness test results have a definite relationship to yield and tensile strengths. These relations are not single lines, but ranges. This is of minor consequence, for the minimum ratio is all that is of interest in specification and inspection. Minimum strength in any metal part can be assured by a hardness determination, or series of hardness determinations. The only complication is with metals like steel that show varying tensile-yield strength ratios due to heat treatment. If the heat treatment is known, however, the hardness-strength relationship can be applied.

Control of modulus of elasticity of gray iron by hardness is just as feasible as control of strength. These three factors vary together.

Substituting hardness tests on the parts for tension testing of specimens is far from downgrading quality. Just the opposite is true. Present controls, especially of heat treatment, which give acceptable consistency of specimen strength, in many instances are unsatisfactory in producing castings to given hardness ranges. That is due to the variation in mass of the castings compared to a constant mass for test specimens. Under this system the tension test is relegated to control of melt quality just as is now done in a number of cast steel specifications. Instead of making a tension test from every heat, only 10 to 20 per cent of the heats are tested in tension after quality control limits have been established.

Notch brittleness, regardless of the headlines, is a minor problem for castings. Failures due to notch brittleness cannot occur even in a notch brittle cast metal unless the yield strength is exceeded, the temperature is near or below freezing, and a properly oriented point of stress concentration is present. If all these conditions are expected, they can be avoided by hardenability and heat treatment for steel and control of microstructure for other notch brittle alloys. Society of Automotive Engineers specifications for steel castings now cover hardenability for that purpose. These specifications also are designed to allow the steel foundryman to produce these steels with the least restriction on chemical composition. The steel foundryman therefore can produce these steels from alloy-bearing scrap with the least amount of virgin alloy. This is an economic and competitive advantage.

Testing for Notch Brittleness—Control of notch brittleness is simple if hardenability, heat treatment, and microstructure are controlled, because low transition temperatures then are automatic. Inspection is more difficult, for all known tests are destructive. Perhaps test lugs attached to the castings and broken off in a manner similar to annealing lugs on malleable iron castings will be an answer, but not even a start has been made along this line. Certainly

testing for notch brittleness will be demanded before long. The foundryman has two choices. He can go along with the trend towards the V-notch Charpy test, or he can advocate a test for cast metals that will fit his conditions better. One such test is the Naval Research Laboratory test for notch brittleness.[10]

The NRL test specimen fits in with foundry operations because no machining is required. Only an arc welder is needed to deposit the hard, brittle weld bead to initiate the crack on a $3\frac{1}{2}$ x 14 x $\frac{3}{4}$ to 1-in. thick specimen, as shown in Fig. 5. Tool room shapers and milling machines are required to shape the alternate V-notch Charpy specimen. A special precision machine is required to test the Charpy specimen. The drop-weight machine to test the NRL specimen can be constructed from unmachined angles as shown in Fig. 6.

An advantage of this test is that a relatively large mass of metal is tested in comparison to the Charpy test, 3.5 vs. 0.12 sq in. The larger specimen practically eliminates any question as to whether it is representative of the part. This question has plagued the Charpy test. The NRL test probably is more severe than the Charpy test, because the notch is much sharper.

Data Must Be Evaluated—Properly evaluating the results of any notch brittle test is important. The most significant point derived from these tests is the transition temperature from ductile to brittle fracture that must be given in degrees of temperature. Data in Fig. 7 may be a solution to this problem. It permits the designer to select a steel, hardenability factor, and heat treatment that will insure toughness to any temperature and at any hardness. At present the data in Fig. 7 must be restricted to test bar results. Many thousands of tests from castings must be made before a relationship similar to that in Fig. 7 can be established for castings. The few tests on castings made to date indicate that the relationship will be similar.

Data in Fig. 7 again emphasize that the notch toughness property at sub-zero temperatures is not important in most casting designs. Note the line for carbon steel. This line represents both cast and wrought normalized and annealed carbon steels. The known resistance to fracture in service at sub-zero temperatures of cast parts made of these steels is due primarily to design and absence of points of stress concentration, and due secondarily to the metal. A change to a more expensive steel that is notch tough at low temperatures need be made only if there are proven failures that cannot be solved by design or inspection.

After notch resistance has been designed into the cast part and the metal specified and under control, casting control involves magnetic particle or penetrant dye inspection for improperly oriented and positioned crack-like defects.

What About the Tension Test—This test never has been valid as a test for anything but the metal itself. This means that the test has significance only as a control of melting practice and in some instances as a control of heat treatment of cast metals. Extension of the tension test to evaluate strength

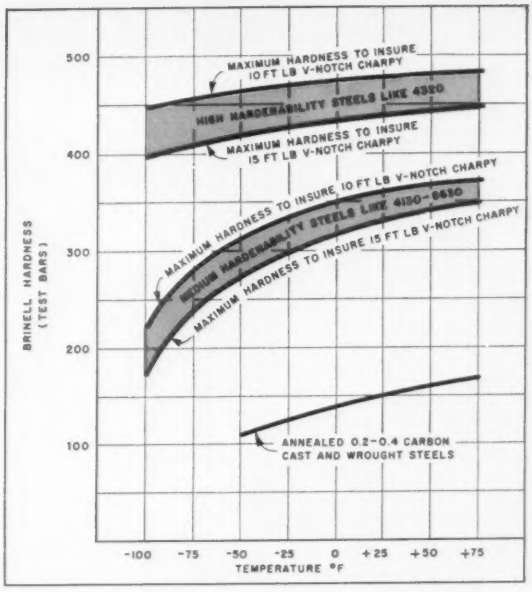


Fig. 7—Showing maximum hardness to insure notch toughnesses at various temperatures. Liquid quenched and tempered 4320, 4130, and 8630 steels and annealed carbon steels

in the sense of service strength has never been valid. It is evident from this discussion that the evaluation of service strength is much more complicated and difficult than indicated by any tensile property or properties. The writer wonders how much the improper use of tensile properties in evaluation is due to human unwillingness to recognize and assume the more complex solution to the problem of service strength.

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Mechanical Properties of

Permanent Molded No. 13 Alloy

Presenting a report on results of an investigation to determine mechanical properties of Number 13 aluminum alloy as cast in permanent molds

By DONALD PECKNER
Materials Engineering Dept.
Westinghouse Electric Corp., East Pittsburgh, Pa.

NUMBER 13 aluminum alloy is a non-heat-treatable grade often used in diecastings. Because of its high silicon content, and consequent fluidity, the alloy also is attractive as a permanent mold casting grade. The nominal composition of the alloy follows: Si—11.0 to 13.0, Fe—0.80 max, Cu—0.30 max, Mn—0.20 max, Zn—0.20 max, Ni—0.20 max, Sn—0.10 max, Mg—0.05 max, other impurities—0.20 max, with the remainder aluminum.

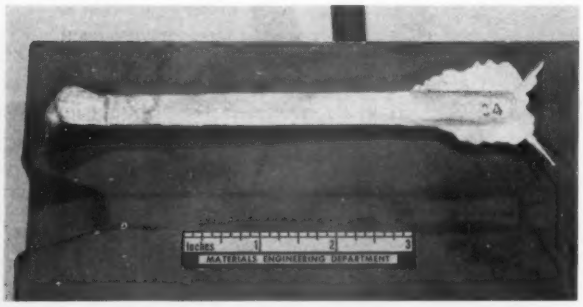

Fig. 1—Test bar and mold which were used in tests of mechanical properties of alloy 13

Mechanical properties are not available for this alloy as permanent-mold cast, and from a specification point of view it was considered desirable to determine these properties. Twenty-five test bars of the type shown in Fig. 1 were poured over a two-month period. Data obtained from these bars represent the average mechanical properties to be expected, and also should reflect normal variations caused by slight differences in chemical composition. Dimensions of the bars before machining were 0.15 x 0.50 x 6 in. A reduced section, 0.40 in. wide, was machined in each bar before testing.

Table 1 lists mechanical properties of the test bars. There is no apparent explanation for the behavior of specimen 23 which exhibited a tensile strength of only 15,300 psi. No defect was apparent on the fracture surface and the tensile test proceeded normally.

Properties Are Charted—Fig. 2 to 4 are arithmetic probability plots of the mechanical properties listed

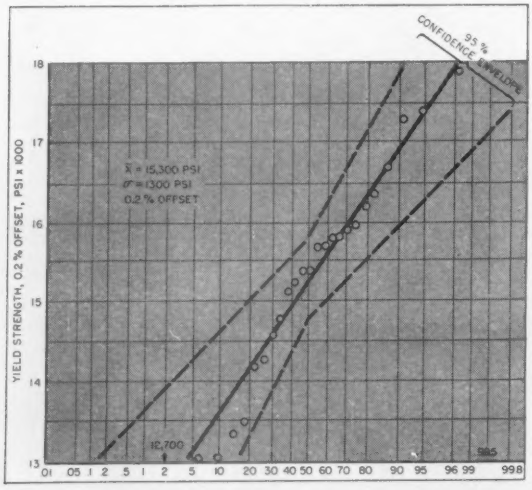

Fig. 2—Distribution of yield strength, alloy 13

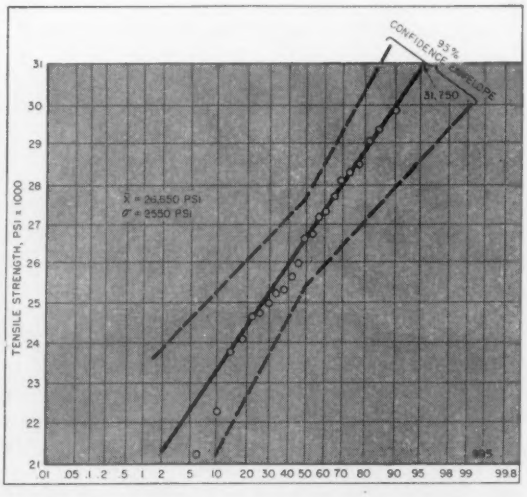

Fig. 3—Distribution of tensile strength, alloy 13

TABLE I—Mechanical Properties of Permanent-Molded Alloy 13

Mark	Yield Strength 0.2% Offset, psi	Ultimate Strength psi	Elongation % in 2 in.
1	17,300	32,600	3.2
2	13,050	22,300	3.2
3	16,700	29,100	2.9
4	15,950	28,300	2.9
5	15,800	26,750	2.3
6	16,350	28,500	3.0
7	15,700	28,100	2.8
8	15,150	27,200	2.5
9	14,200	23,800	2.8
10	15,900	29,850	3.4
11	15,850	24,100	2.3
12	15,400	25,350	2.2
13	16,200	25,300	2.0
14	15,700	29,400	2.8
15	17,900	27,700	2.7
16	17,400	26,650	2.1
17	15,400	27,300	2.1
18	14,600	26,000	3.1
19	13,500	25,700	3.1
20	12,700	24,700	2.6
21	14,800	24,800	2.5
22	15,250	31,750	4.2
23	14,300	15,300	1.5
24	13,350	25,050	2.5
25	13,050	21,250	1.9

in Table 1. Arithmetic probability paper can be used to obtain the arithmetic average ($\overline{X}$) of a series of observations as well as an estimate of the standard deviation (s). The value of $\overline{X}$ is read directly as the intercept of the ordinate and the 50 per cent abscissa. The estimate of the standard deviation (s) is obtained by subtracting the value of the intercept of the ordinate and the 16 per cent abscissa from $\overline{X}$.

Using this technique, it can be seen from Fig. 2 that the average yield strength of this series of test is 15,300 psi with an estimated standard deviation (s) of 1300 psi. One can, therefore, state that 95 per cent of the yield strength values will lie within the range $\overline{X} \pm 2s$ or 12,700 psi to 17,900 psi.

On the same basis, average tensile strength is 26,650 psi with an estimated standard deviation (s) of 2550 psi. Range of tensile strength will be 21,500 to 31,750 psi, 95 per cent of the time. The range for elongation is 1.55 to 3.75 per cent 95 per cent of the time, with an average value of 2.65 per cent.

At this point, it might be well to explain a situation which might be confusing. We can deal, essentially, with two ranges, both of which encompass 95 per cent of the distribution. One range, $\overline{X} \pm 2s$, excludes 2½ per cent of the sample on both the low and high side of the range. This can be seen in the diagram of a normal distribution, Fig. 5.

The second range covers 95 per cent of the distribution and excludes 5 per cent of the sample on the low side of the range, Fig. 6. This latter range is determined on the following basis: The values plotted on the curves in Fig. 2 to 4 represent the most probable values to be expected in the distribution of mechanical properties of alloy 13. The intercept of this average value curve, and the 5 per cent point on the abscissa represents the most probable minimum value to expect 95 per cent of the time. The intercept of the righthand portion of the 95 per cent confidence envelope, which takes into account inherent errors in the mean and standard deviation of a sample, with the 5 per cent point represents the minimum value which can be expected 95 per cent of the time.

For statistical purposes, the range $\overline{X} \pm 2s$ indicates the variability of the measurements. For design purposes, the top 95 per cent of values are of interest.

Conclusion—The following minimum properties may be expected 95 per cent of the time in permanent-mold-cast alloy 13.

	Most Probable Minimum Value	Minimum Value (Determined from Confidence Envelope)
Tensile strength	22,300 psi	20,200 psi
Yield strength, 0.2% offset	13,200 psi	12,200 psi
Elongation, % in 2in.	1.8%	1.3%

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Fig. 5—Distribution curve that excludes 2½ per cent on both the low and high sides of the range

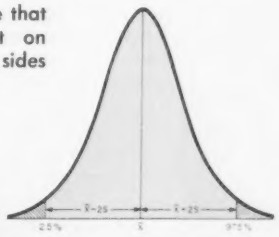


Fig. 6 — Distribution curve that excludes 5 per cent of sample on low side of the range

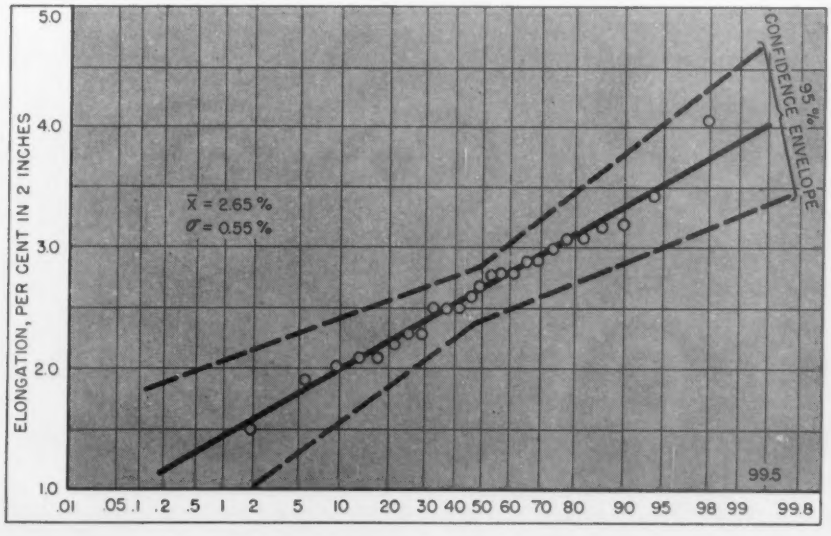


Fig. 4 — Distribution of elongation, alloy 13, per cent in 2 in.

Questions and Answers

Wants to make semipermanent molds . . . Seeks information on hot quenching of gray iron . . . Would like to construct coke-fired brass melting furnace . . . Gas is cause of pinholes in aluminum permanent mold castings

In a recent issue in this department of FOUNDRY we saw a mention of molds made from refractory materials and hydrolyzed ethyl silicate which are suitable for the production of several hundred aluminum castings. Can you supply further information on this process?

The process of making semipermanent molds of a refractory bonded with ethyl silicate is similar to that used for the investment process except that the mold is made on a regular pattern instead of using disposable wax or plastic patterns. Metal patterns are preferred although wood patterns with suitable lacquer coatings may be used. Shellac is soluble in the alcohol present in hydrolyzed ethyl silicate, and will give trouble in sticking, poor mold surface, etc.

Refractory may be silica sand, sillimanite, etc., of suitable fineness to produce the desired smoothness of surface on the castings. One mixture might be 0.4 parts by weight of magnesium oxide, 34.6 parts of silica flour, 45 parts clay-free 140 mesh silica sand and 20 parts 35 to 60 mesh silica sand. The hydrolyzed ethyl silicate is added in the proportions of 3.4 oz (liquid) to 1 lb refractory.

Details on hydrolyzed ethyl silicate may be obtained from the various suppliers. One suggested procedure is to stir 15 volumes of condensed ethyl silicate into a mixture of 8 volumes of 190 proof denatured ethyl alcohol and 2 volumes of 1 per cent hydrochloric acid. This mixture should stand at least two hours before use. Working solution is obtained by diluting the mixture with additional water to obtain decreased setting time. Under most conditions a setting time of 50 to 60 minutes is suitable, and by addition of 6.5 volumes of water to 100 volumes of the ethyl silicate solution at a temperature of 68° F a setting time of 50 minutes is obtained.

To make a mold the pattern is coated carefully with wax dissolved in carbon tetrachloride or other solvent by spraying or brushing. The pattern is enclosed in a wood frame made of two L-shaped sections which are clamped together to form a box or flask. Box and pattern are placed on a vibrator plate, the box filled with the prepared refractory, and allowed to vibrate for at least 20 minutes to insure proper packing of the refractory around all areas of the pattern. At the end of the setting period the frame is taken off and the mold is removed carefully from the pattern.

Since some alcohol still may be present, the mold should be ignited to burn it off. Then the mold is placed in an oven and heated to a temperature of 1400° F to dry it thoroughly. In operation the mold should be heated prior to use just as in the case of a metal mold. For aluminum the temperature suggested is 480 to 575° F and 840 to 850° F for brass.

We recently came across a reference to hot quenching of gray iron and would like to have some information on the subject. Can you fill us in on the details?

Since our space is limited we can only touch on the general principles involved in hot quenching. For details you will have to turn to some source like the *Gray Iron Castings Handbook*, which devotes about six pages to the subject.

Briefly, hot quenching or isothermal heat treatment is a process of quenching gray iron from a temperature above the critical range in a bath of salt, oil, or molten lead whose temperature is well above room temperature. Casting is held in the quench bath until desired properties and structure have been attained.

Usual practice is to heat the casting to 1500 to 1700° F and then quench in the hot bath whose temperature ranges from 450 to 850° F. The bath usually is at the maximum permissible temperature to obtain the desired structure and properties and relieve most of the quenching stresses tending to produce distortion and cracking. Hot quenching takes advantage of transformations occurring when iron is cooled rapidly to temperatures below those at which relatively soft pearlite forms. Hot quenching can be divided into the two operations of austempering and martempering.

In austempering, the microstructural end product essentially is bainite, a structure formed below the pearlite temperature range but above the martensite range. The iron is heated to 1400 to 1650° F and held for 20 minutes per in. of thickness after reaching the temperature. It is quenched in salt, oil, or lead baths at 450 to 800° F. When high hardness and wear resistance are desired, the bath temperatures are within the lower range of 450 to 550° F. Holding time in the bath for maximum transformation to bainite is dependent on the temperature and composition of the iron.

Martempering is used to produce a martensitic structure without developing the high stresses usually accompanying its formation. It is similar to conventional quench hardening except that distortion practically is eliminated. A considerable portion of the innate brittleness of martensite remains, and tempering is employed to remove it.

In martempering, the casting is heated to high temperature as in the case of austempering, and quenched in salt, oil, or lead bath held at a temperature slightly above the martensitic transformation range, which is about 400 to 500° F for most unalloyed irons. The

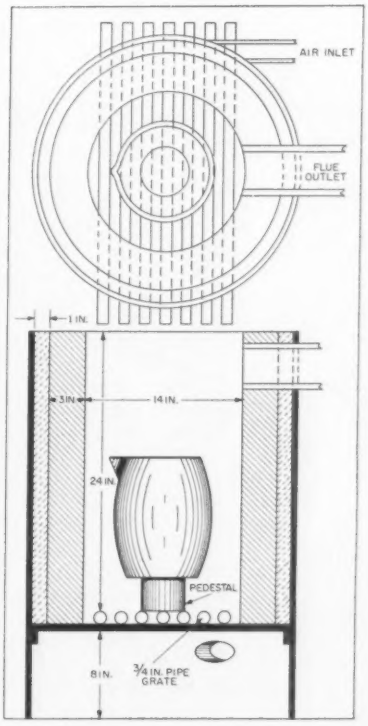
casting is held in the bath only long enough to reach the temperature, then is cooled in air and tempered.

Typical martempering cycle for gray iron cylinder liners containing 3.25 to 3.50 TC, 2.05 to 2.55 Si, 0.55 to 0.60 Mn, 1.0 to 1.5 Cu, 0.55 to 0.80 Cr, and 0.10 to 0.25 Ni is given as preheating to 1200° F and holding for 5 minutes; heating to 1575° for 8 minutes; quenching in an agitated salt bath at 650° and holding for 1 minute. Then they are air cooled for 1 hour and tempered at 350° F. Hardness after treatment is 50.2 Rockwell-C.

[redacted]

We are planning to start a small nonferrous foundry, and would like to have some information on constructing a coke-fired, forced-draft furnace. We want one which will take a No. 20 crucible.

While we believe you will be farther ahead by purchasing a furnace, the accompanying sketch gives some detail which you can use for a do-it-yourself construction. The steel shell for the unit should be 22 in. in diam and about 32 in. high with an insulating-type refractory lining at least 1 in. thick rammed against it. The refractory lining is silicon carbide type and 3 in. thick. If some



Some details of furnace construction

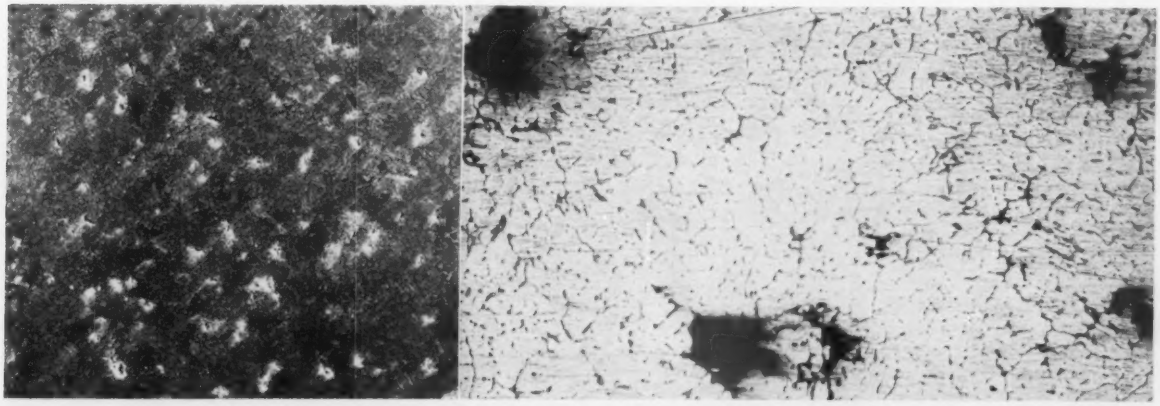
other refractory is employed, you might not need the insulation between lining and shell. Silicon carbide is an excellent conductor of heat, and if it is not surrounded by insulation, the heat losses through the shell will be high.

Air inlet in the bottom section is located at a tangent to give better distribution of the air stream. We believe that a blower which will supply air at 2 to 4 oz. pressure should serve. While we do not have any definite information on the air volume required, we might assume that 25 lb of coke will be required to melt a 60-lb charge in 30 minutes. On that basis an air volume of 110 to 115 cu ft per minute would be required.

Grate for the furnace can be made of suitable lengths of ¾-in. pipe inserted in holes drilled through the shell. That arrangement will permit air leakage, and possibly it might be difficult to pull the pipes out when they become burned unless the holes are made large. Hence, it would be better to cut a slot in the shell at the grate location which can be covered with a removable, sheet metal door.

[redacted]

We are forwarding for your consideration a section from one of our permanent mold castings made from aluminum alloy N. 750. (5.5 to 7.0 Sn). Note the white silvery pits on the machined surfaces. Can you tell what causes this porosity?



Left, 15X magnification of polished and etched surface shows large number of pinholes. Right, 50X magnification does not reveal presence of dendrictic formation which is indicative of shrinkage

So far as we can tell from examination of the 1¼-in. section of a large bearing, the fine porosity—or pits as you call them—is caused either by gas absorbed during melting or by air inspirated during pouring. Air inspiration can result from a poorly designed sprue or from having the lip of the crucible or pouring ladle at too great a height above the sprue opening.

Other possible causes of gassy metal include use of pouring crucibles or ladles which are not thoroughly dry, solid degassing fluxes which have become damp from exposure to the air, and damp diffusing tubes used with gaseous agents.

This opinion is based on examination of fractured sections with a low-powered magnifying glass. It showed only the presence of small holes without any indications of the feathery dendritic structure associated with shrinkage caused by lack of feed.

Centrifugal Casting of Tubes

Can you supply us with any information on production methods and techniques employed in the manufacture of centrifugal castings? The ones we have in mind are bronze from 10 to 40 in. in diam.

Although you indicate the diameters of the castings to be cast centrifugally, you do not mention the length, which would have an influence on the method of manufacture. Tubes or pipes in which the length is considerably greater than the diameter are spun on the horizontal axis, whereas short lengths such as rings are rotated on the vertical axis. Molds for centrifugal castings usually are made of metal which may be lined with sand or just coated with a refractory wash. Sometimes graphite molds are used. With unlined metal molds and those of graphite, a mold is required for each casting diameter. In the case of sand-lined molds, one mold can be employed for several casting diameters by varying the sand thickness.

With sand-lined molds, the green or moist sand is rammed in place between the mold, and a short, cylindrical pattern is centrally located. Pattern is about 3 ft long, and after the sand is rammed around it, the pattern is raised about 2½ ft, and another layer of sand rammed in place. That cycle is continued until the desired length is obtained. Then the mold with its lining is placed in an oven and baked until the sand is dried thoroughly.

Rate of rotation for tubes spun on the horizontal axis depends upon the outside diam and the ratio between the centrifugal force and mass. Latter usually is 60 for unlined metal molds and 75 for sand-lined molds. Rate of rotation can be determined from the formula, N equals 265.3 times the square root of Q divided by D where N is rpm, Q is the ratio between centrifugal force and mass, and D is the diam in inches.

Wants Data on Loss of Metal

For some years we have been experiencing some rather significant brass losses in our foundry and now have had the same difficulty with diecast aluminum since our acquisition of diecasting machines a few years ago. We have allowed a certain percentage to represent this processing loss from the time the ingot is put into the furnace until the final casting is produced, but these percentage allowances do not seem sufficient. Brass ingot is the 83-5-7-5 alloy, and the aluminum alloy for diecasting is the 3½ Cu, 11 Si type. Alloys are melted in crucible furnaces. On the basis of this information, can you suggest figures to cover flue and other losses for each of the alloys? We realize that types of dies, ability of pourers, etc., affect these material losses, and we will appreciate an estimate of normal allowances for these conditions.

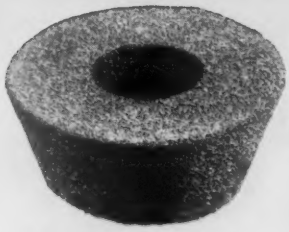
Your inquiry on metal loss allowance as indicated by the difference between the amount of metal charged into the crucible and that obtained in the final castings cannot be answered definitely since accurate figures are not available. It might be pointed out that considerable work would be involved in obtaining reasonable data since metal may be lost in many operations between charging the pot and the finished castings. With reference to brass or bronze castings, St. John in *Brass and Bronze Foundry Practice* indicates the following — melting loss, skim and spill, pouring loss, sand blasting, and grinding or snagging loss. Melting loss is that due to volatilization of certain elements such as zinc. Skim and spill loss is that encountered in skimming and spilling at the furnace side and mold side. That may not be a total metal loss since some metal may be recovered by treatment of that material. Pouring loss is due to volatilization and to spattering of fine droplets of metal. Losses in sand blasting and in grinding are self explanatory.

Melting loss in copper-base alloys depends on composition and furnace operation. Alloys high in zinc show a greater loss. High temperatures and holding the metal in the furnaces after pouring temperature is reached also increase loss. St. John indicates a loss of from 1½ to 4 per cent, which agrees with other figures in the literature, but it may run as high as 10 to 15 per cent where considerable amounts of turnings and borings are used. Loss due to skims and spills may range from 1 to 2 per cent, and loss during pouring is indicated as 0.5 per cent. Grinding loss may run from 0.9 to 3.2 per cent depending on the gating system and attachment to the casting. Where over gating is used and where removal leaves large stubs, loss will be higher than with normal gating and where gate stubs require minimum grinding. These data indicate that the metal loss may range from about 4 to 10 per cent or even to 20 per cent in production of copper-base alloy castings.

Unfortunately, little information on possible metal losses in diecasting operations is available. Some data, but not recent, have been presented in the literature on metal loss in melting aluminum alloys, and they indicate that the gross loss where metallics are not recovered from the drosses, may range from 1 to 6 per cent, and where the drosses are treated to recover the metallic content, the net loss is from 2 to 2.5 per cent. Losses in other areas will have to be determined in your own plant by following through from the time a definite amount of metal is charged into the melting furnace, transferred to the holding furnaces at the diecasting machine, etc., until the final finished castings are obtained, with weighings between each step, cleaning up and recovering any visible metal in each step.

"I don't think the melting department is getting the hydrogen out"

US RUBBER GRINDING WHEELS



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Circle 595 on Page 119

Men of Industry

● **HAMPTON W. CAMPBELL**
. . . becomes general mgr.

● **JOHN H. KING**
. . . national director, AFS

● **DR. THOMAS J. McLEER**
. . . becomes research director

● **HAROLD C. GRANT**
. . . manager, Ford foundries

HAMPTON W. CAMPBELL, since 1954 assistant general manager, Lynchburg Foundry Co., Lynchburg, Va., has been named general manager and a director. With the company since 1930, he spent 10 years in the sales, production and standards departments. Later he became plow foundry foreman, plow foundry superintendent, general foundry superintendent, and works manager at the Lynchburg plant.

C. W. Ray, formerly manager, Materials Engineering Dept., Deere & Co., Moline, Ill., has been named manager of the company's Malleable Works in East Moline. He succeeds **R. D. Tolmie,** who has been appointed manager of the John Deere Harvester Works there.

Alvin B. Steger, William R. Smither, and **Kenneth W. Pfeifer** have been appointed sales engineers, Hamilton Foundry & Machine Co., Hamilton, Ohio. Mr. Steger was formerly a sales-service representative for the company. Mr. Smither joined the company in 1953 as a metallurgist. Mr. Pfeifer, formerly with General Electric Co., Cleveland, has been in Hamilton's sales training program since May.

Wayne H. Buell, executive vice president, Aristo Corp., Detroit, has been awarded an honorary degree of Doctor of Engineering by Lawrence Institute of Technology. Mr. Buell has been outstanding in the field of core oil research.

● **John H. King,** president, Archer-Daniels - Midland Co. (Canada) Ltd., Toronto, Ont., has been chosen to serve as a national director of the American Foundrymen's Society, to fill the unexpired term of the late Alex Pirrie. Mr. King has served as sales manager and vice president of the company, which he joined in 1939. He became president early this year.

● **Dr. Thomas J. McLeer** has rejoined Cooper Alloy Corp., Hillside, N. J., as director of research and development activities. He left the company in 1953, after three years of specialized work in shell molding. Recently he was with General Electric Co.'s foundry, Schenectady, N. Y., responsible for casting design.

C. John Sundberg, assistant to the vice president and director of sales, Norton Co., Worcester, Mass., has retired, following 46 years with the company. He will make his home in Florida.

John P. Cartwright has been elected vice president-general manager, Industrial Div., Joy Mfg. Co., Pittsburgh. **J. Y. Richards,** formerly Chicago district sales manager, has succeeded Mr. Cartwright as sales manager of the Industrial Division.

George V. Clark, for the last year sales engineer, Baker Industrial Trucks Div., Otis Elevator Co., Cleveland, has been appointed western district manager, with headquarters in Los Angeles.

● **Harold C. Grant** has been named manager, Dearborn Iron and Specialty Foundries, Ford Motor Co., Dearborn, Mich. He joined the company in 1933 and from 1945 to 1950 was superintendent of small parts coremaking in the Dearborn Iron Foundry. He then became manager of the Dearborn Specialty Foundry and was named plant manager there in 1954. **John W. Schneider,** former manager of Dearborn Iron Foundry, has been assigned to the staff of **Frank X. Bujold,** manufacturing manager of foundries.

Albert C. Fisher, for the last 30 years associated with Blaw-Knox Co., Pittsburgh, has been elected vice president, Pittsburgh Steel Foundry Corp., Glassport, Pa., in charge of sales-engineering for the Pittsburgh Engineering & Machine Division.

Albert S. Vetter has joined the belting division sales department, C. R. Daniels Inc., Daniels, Md., with headquarters in the New York office.

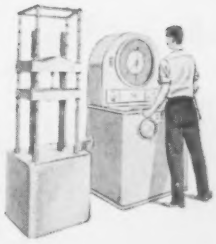
E. T. Cuddeback has been appointed southeast regional manager, general products division sales, Allis-Chalmers Mfg. Co., Milwaukee. He was formerly Florida district manager. **Ralph L. Haney** has been named Philadelphia district manager, and **Charles E. Dandois,** Allentown, Pa., district manager for the industries group. Mr. Haney succeeds **C. W. Parker Jr.,** recently

"I always get good ductility using calcium alloys"

Steel foundries employing aluminum deoxidation obtain improved properties by making a supplementary addition of calcium-silicon or calcium-manganese-silicon to the ladle. These calcium alloys help obtain consistently good ductility in the tensile test. Many foundries also report improved fluidity with the calcium additions. Generally 3 to 5 lbs. of alloy per ton insure effective treatment.

ELECTRO METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y.

Contact your ELECTROMET representative for further information on getting improved ductility with calcium alloys.



Electromet

FERRO-ALLOYS AND METALS

UNION CARBIDE

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Circle 596 on Page 119

● DONALD G. SCHMIDT
. . . heads Chicago Chapter

● GEORGE H. LIESER

● LEE D. STEVENS

● ROY T. ROMINE

Techline Div. of Wheelabrator Corp. appointments

named director of sales promotion for the group. Mr. Haney was formerly manager at Allentown and Mr. Dandois was a sales representative there.

● **Donald G. Schmidt,** elected president of the Chicago Chapter of the AFS for 1958-59, is a metallurgical engineer in the research department of H. Kramer & Co., Chicago. He joined the company after graduation from Missouri School of Mines. Mr. Schmidt was vice president of the chapter last year.

Robert L. Kulp, since 1938 chief draftsman, has been named sales engineer, Reading Crane & Hoist Corp., Reading, Pa., to cover the area east of the Mississippi River. He joined the company in 1923.

● **James Patterson** has been appointed Philadelphia sales representative, National Engineering Co., Chicago. He was formerly with Simplicity Engineering Co., Durand, Mich. Mr. Patterson replaces **E. C. Troy,** who has become vice president, Pennsylvania Electric Steel Casting Co., Hamburg, Pa.

● **George H. Lieser** has been appointed field sales manager of the new Techline Div. established by Wheelabrator Corp., Mishawaka, Ind., at Vicksburg, Mich., as the result of acquiring Crandall Engineering & Mfg. Inc., there. Mr. Lieser was department head of the Liquamatte line of wet blast equipment at Wheelabrator the last 8 years. **Roy T. Romine,** who founded Crandall Engineering in 1957, has been named chief engineer of the new division. **Lee D. Stevens,** formerly a process engineer in the barrel finishing industry, has been named director of process engineering. **Jacob A. Schmidt Jr.,** secretary-treasurer of Wheelabrator, is general manager of Techline Div.

Eric Schlesinger, formerly Wisconsin manager, Black Products Co., Chicago, has joined the sales staff of Milwaukee Chaplet & Supply Corp., Milwaukee.

● **Harvey K. Waters** has been named manager of the district office recently opened in Minneapolis by Whiting Corp., Harvey, Ill. He had been in the Charlotte, N. C., office since 1954. **George Kleinman,** since 1953 a chemical process engineer in the Houston office, has been transferred to Charlotte. **Thomas R. Elmblad,** formerly of the Chicago office, has been transferred to Pittsburgh.

James O. Wine has been appointed district sales representative, Contractors Machinery Div., Yale & Towne Mfg. Co., Batavia, N. Y., in the middle Atlantic and New England states, and eastern Canada, with headquarters in Allentown, Pa. He was formerly eastern sales representative, Allison Div., General Motors Corp., Detroit.

William Davis has been appointed manager of the San Francisco district office and warehouse, Jeffrey Mfg. Co., Columbus, Ohio, with headquarters in Burlingame, Calif. He succeeds **Stanley M. Mercier,** who will continue as a consultant until his retirement at the end of the year. **Elmer Longnecker** has replaced **John Warren** as Detroit district manager. Mr. Warren will continue some of the company's accounts in the area. The following have been assigned as sales

● JAMES PATTERSON
. . . Natl. Engineering sales

● HARVEY K. WATERS

● THOMAS R. ELMBLAD
Appointments, Whiting Corp.

● GEORGE KLEINMAN

"Why are more and more foundries taking advantage of Knight Engineering Surveys?"

"Because **Knight's specialized foundry engineering experience** and independent, professional approach represent valuable counsel to management."

Knight services include:

Foundry Engineering
Architectural Engineering
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Organization
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Industrial Engineering
Wage Incentives
Cost Control
Standard Costs
Flexible Budgeting
Production Control
Modernization
Mechanization
Methods
Materials Handling
Automation
Survey of Facilities
Marketing

Knight Engineers are well qualified to analyze foundry operations and recommend methods, processes and machines. The Knight organization has successfully completed more than 350 assignments in every type and size of foundry. Surveys are made impartially, considering only facts and economical solutions—not influenced by other responsibilities to management or an interest in equipment sales. Call us for a preliminary discussion of how a Knight Foundry Survey can help you.

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Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

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917 Fifteenth St., N.W., Washington, D. C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16
Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland

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● M. G. BLICKENDERFER
. . . joins Acheson Colloids

● W. R. BARBER

● JOSEPH E. McQUAID
Electric Steel Foundry appointments

● DAR G. JOHNSON JR.

representatives in district offices of the company: **Roy Adams**, Birmingham; **Melvin Ledger**, Buffalo; **Alex Steele**, Bluefield, W. Va.; **Al Pingpank**, Columbus, Ohio; **John Sherrell**, Houston; **William Taylor**, Milwaukee; and **Keith Beachler**, San Francisco.

● **Michael G. Blickenderfer** has been appointed northern Ohio sales engineer in the Cleveland office, Acheson Colloids Co., Port Huron, Mich., division of Acheson Industries Inc. He had been with Glidden Co., Cleveland, for nearly three years.

C. L. Safford Jr. has joined St. John X-Ray Laboratory, Califon, N. J., as representative for film badge monitoring service in Michigan, Ohio, and western Pennsylvania, with headquarters in Cleveland.

John W. Holzwarth has been named manager of the western district office in Santa Ana, Calif., recently established by Electric Furnace Co., Salem, Ohio. He joined the company in 1940.

● **W. R. Barber**, assistant to the vice president in charge of sales, Electric Steel Foundry Co., Portland, Oreg., has been appointed administrative manager of the metallurgical department. **Joseph E. McQuaid** has been made general sales manager. **Dar G. Johnson Jr.** has joined the sales department as assistant general sales manager. **Robert L. Zwald** has succeeded Mr. Johnson as advertising manager.

● **Russell A. Lawson**, formerly vice president in charge of sales, Monarch Aluminum Mfg. Co., Cleveland, has been appointed vice president-marketing. **Walter V. Tracy** has been named general sales manager of the Commercial Div. He had been assistant general sales manager of the Commercial Castings Div. **Donald L. Jack** will continue to assist Mr. Tracy as sales office assistant. **Gerald C. Liebel** has been made manager of the eastern territory with headquarters in Rochester, N. Y. **Joseph Shrier**, with headquarters in Cleveland, will manage the central territory, and **Manley S. Hutchinson**, formerly eastern representative, has become manager of the western territory. He will be located in Cleveland.

Ray M. Ronald has been named vice president in charge of the tractor equipment division, Hyster Co., Portland, Oreg., with headquarters in Peoria, Ill. He was transferred to Peoria last year from the West Coast district. **Frank A. Rostedt**, managing director of the company's plant in Nijmegen, the Netherlands, has been appointed vice president in charge of the international division in Peoria.

James E. Whitehead has been named sales-service representative, Lewis-Shepard Products Inc., Watertown, Mass., with headquarters in Birmingham, to cover Alabama, northwest Florida and southeast Mississippi.

Harold T. Hunter has been elected vice president, Philadelphia Bronze & Brass Corp., Philadelphia, subsidiary of P. R. Mallory & Co., Indianapolis. He will continue in his position as sales manager.

John R. Hanson has been appointed sales representative, J. H. France Refractories Co., Snow Shoe, Pa. He will service the New England states and east central New York.

Gene B. Evridge recently joined Eastman Kodak Co., Rochester, N. Y., as midwestern technical representative specializing in industrial radiography, with headquarters in Chicago.

Hjalmar A. Anderson, recently project engineer, Gas Machinery Co., Cleveland, has been appointed chief engineer, Burdett Mfg. Co., Chicago.

● WALTER V. TRACY

● RUSSELL A. LAWSON
Monarch Aluminum promotions

R. W. Creamer, V.P., checks x-ray films of tank welds.

Picture of a man saving $400 per unit

It's done with Kodak Industrial X-ray Film, Type AA

Creamer and Dunlap, Inc., make pressure vessels—big ones, 67 ft. long by 9 ft. in diameter. Because they radiograph every inch of every weld to determine soundness, they can use thinner plate. This results in about 10% less weight with attendant savings in fabrication, handling and shipping. Altogether it adds up to as much as $400 per unit.

What's more, radiography helps to assure customers of a high-quality, safe product.

This company switched to Kodak Industrial X-ray Film, Type AA, because, "This film," they say, "is faster and has superior contrast, definition and radiographic sensitivity."

Your x-ray dealer and the Kodak Technical Representative will gladly tell you how Kodak film can improve your radiographic operation and help you get more out of your present x-ray or gamma-ray equipment. It can pay you to get in touch with them.

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- Speeds up radiographic examinations.
- Gives high subject contrast, increased detail and easy readability at all energy ranges.
- Provides excellent uniformity.
- Reduces the possibility of pressure desensitization under shop conditions.

EASTMAN KODAK COMPANY, *X-ray Division*, Rochester 4, N.Y.

For inspection of welds, Kodak Industrial X-ray Film, Types AA, M, and KK, are available in the 70mm by 550 ft. package, as well as in standard sheet sizes.

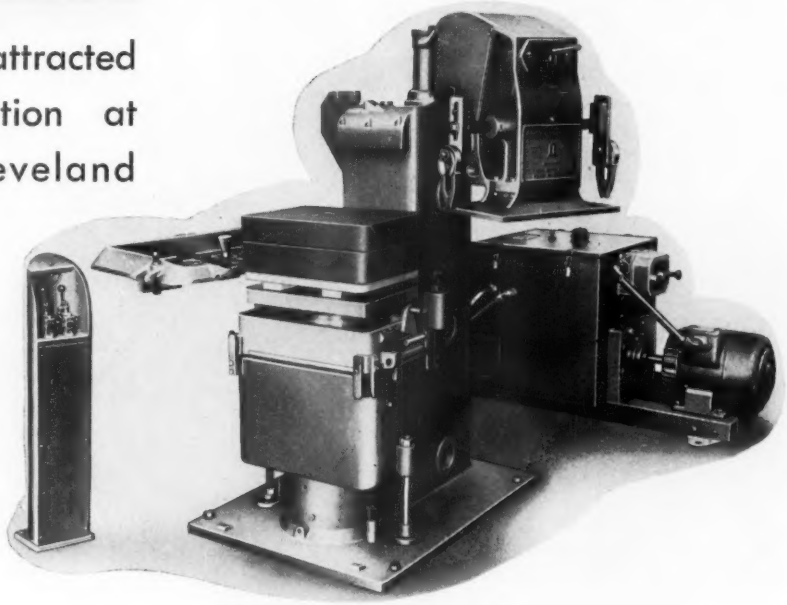
Kodak
TRADE MARK

Circle 598 on Page 119

H.E.B.

HYDROIL-ELECTRIC FLASKLESS MOLDING MACHINE

The Machine which attracted your special attention at Foundry Show, Cleveland May 1958.



H.E.B. IS THE ONLY MACHINE OF ITS TYPE IN THE WORLD—

IT FEATURES:—

★ **One man operation** . . . . .
produces complete flaskless mold (cope and drag made simultaneously) in 35/40 seconds—up to 100 molds per hour.

★ **Two standard mold sizes** . . .
17″ x 12″ on H.E.B.1 and 18″ x 14″ on H.E.B.2 for high speed production of light castings using double face pattern plates.

★ **3 Second pattern change** . . .
lift out and drop in new plate!

★ **Core setting** . . . . . .
one easy movement.

★ **Independently powered** . . . .
high pressure vane type oil pump unit with remote control.

★ **Minimum maintenance** . . . .
oil operation in closed circuit; non-rusting, non-freezing; no long pipe lines; no pressure loss.

Send for Bulletin 151/NA for full description and diagrams showing unique operating principles.

U.S. Pat. Pending; Canadian Pat. No. 531479; British Pat. No. 748551. Patents granted or pending in other Industrial Countries.

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Weathering a Recession

By JOHN L. CARTER
Cost Consultant
Gray Iron Founders' Society Inc.
Cleveland

This article concluded a series of five by Mr. Carter on various aspects of "Weathering a Recession" which appeared in Gray Iron News, a magazine published by the Gray Iron Founders' Society, Cleveland, for its members. It is reprinted here through the courtesy of GIFS because of its importance to management of every type of foundry. As the editor of this magazine pointed out recently (FOUNDRY, August, 1958, p. 39), action now to improve a foundry's operation may be the deciding factor in determining whether it will be around to participate in the next big surge in casting demand.

A RECESSION usually is regarded as an unmixed evil, and so far as its effect on current profits is concerned, this attitude undoubtedly is correct. But for foundries in which efficiency is not what it should be, a recession may be a blessing in disguise. It offers a particularly good opportunity to put cost-reduction measures into effect. Many measures to improve efficiency can be put into effect more easily and with better chances of success during a recession than in boom times. Some of the reasons for this situation may be summarized as follows:

Attitude of Workers—When other jobs are scarce, workers are more willing to accept major cost-reduction measures which they might fight when business is good and other jobs easy to get.

Attitude of Top Management—When a business runs up against tough times and perhaps suffers financial losses, the owner or general manager often is jolted out of complacency and conservatism. He becomes more willing to approve progressive cost-reduction measures than he was when the business was sailing along smoothly and making money.

Availability of Time—Shop executives have more time to devote to cost-reduction projects when the shop is shut down one or two days a week or when they have a smaller number of men to supervise.

Availability of Labor—More men are available to work on improvements in layout or installation of new labor-saving equipment. More time is available on off days to make such changes without interfering with regular production.

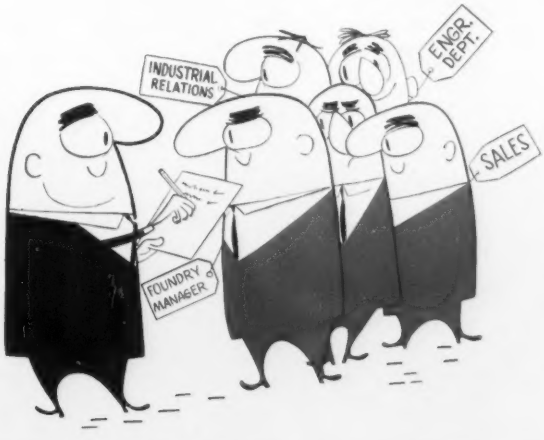
Management Personnel Available—It is easier to locate good management personnel if the organization needs strengthening in any respects.

Reducing Costs—Some of the cost reduction measures or policies that I have in mind are as follows: 1. Establishing production standards by time study, motion study, methods engineering, etc. 2. Getting production up to approach these standards as closely as possible on a time-work basis. 3. Putting incentive systems into effect. 4. Revising old, inflated piece rates or incentive rates. 5. Improving layout in various departments. 6. Installing new labor-saving equipment, particularly molding or coremaking machines or auxiliary equipment which involves increasing production or decreasing piecework rates on jobs formerly made by hand. This step would include partial or complete mechanization. 7. More effective cost control records and procedures. 8. More effective quality control program. 9. Improving shop discipline. This point can be an important factor in improving production. 10. The time also is ripe for strengthening shop and sales organizations.

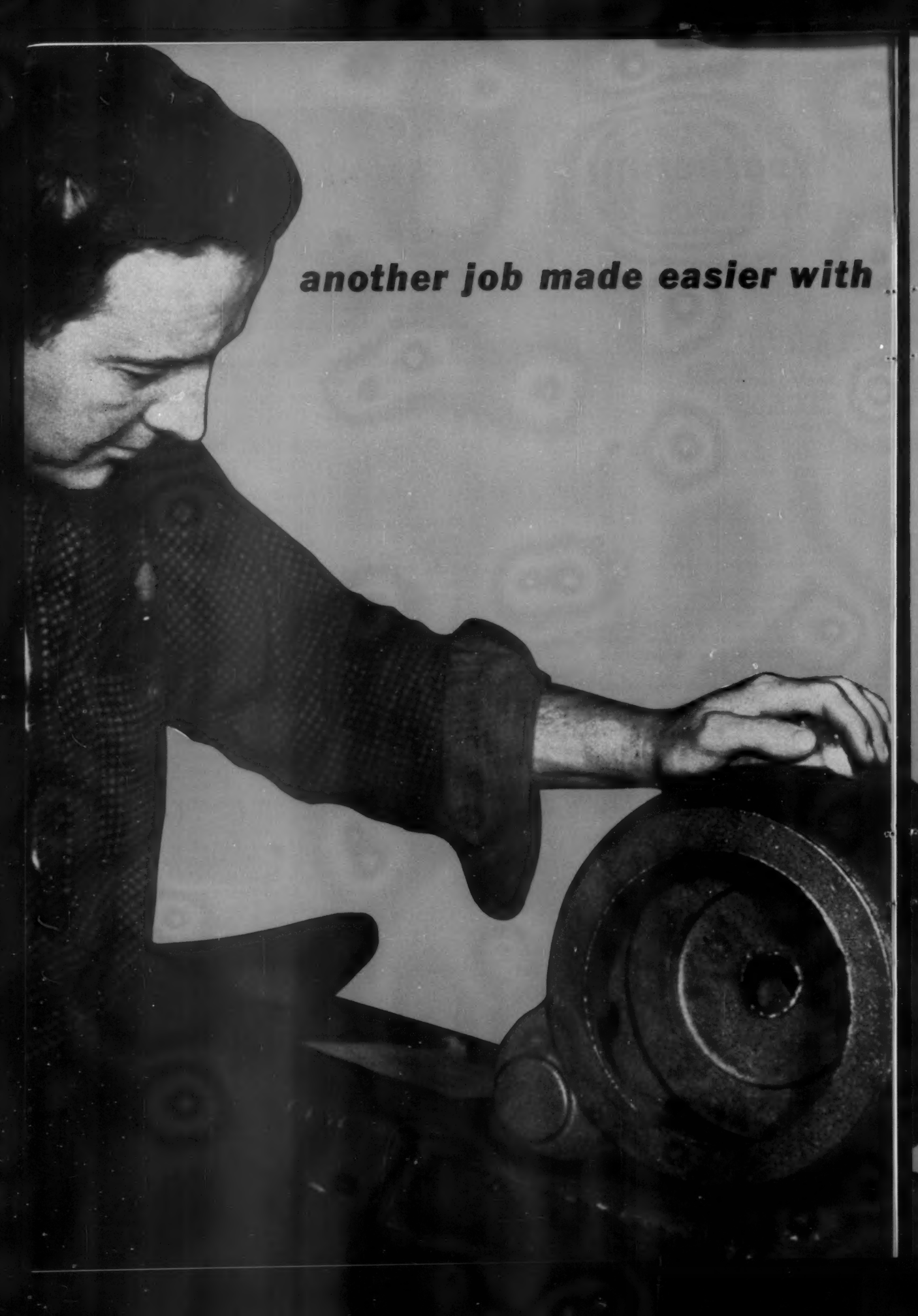
All of these measures to improve efficiency can be put into effect more easily and with better chances of success during a recession than in boom times. Most of them are now in effect in so many of the more progressive foundries that others must follow suit or face a very precarious future. This rather unexpectedly prolonged recession is likely to sort out those foundries which have not yet attained a reasonably high degree of efficiency into two classes:

1. Those which take advantage of the special opportunities to strengthen their organization and improve their efficiency will emerge from this recession stronger than ever before.

2. Those which do not do so will



Foundries in which top management takes advantage of the recession's special opportunities to increase efficiency and lower costs will emerge from the slowdown stronger than ever


another job made easier with

OSBORN ROTA-LIFT

SAND TO FINISHED MOLD MECHANICALLY

Mechanized molding results in better castings ... at lower cost

Foundries using Osborn Rota-Lifts for producing molds from large match plate patterns find that simplicity of operation and constant uniformity greatly increase production efficiency.

Rota-Lift jolts, rolls over, squeezes, draws and closes the mold ... all mechanically. Large match plate work is quickly and efficiently handled.

Rota-Lift models are made in different sizes to fit a wide range of foundry molding jobs. Your Osborn foundry specialist will gladly recommend the right Rota-Lift to improve and increase your mold production. Write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

One man, one machine ... Rota-Lift produces up to 25 molds per hour, 3 cores to a mold at The Deming Company, Salem, Ohio, manufacturers of pumping equipment.

leader in mechanization for the foundry OSBORN®

MOLDING MACHINES SHELL MOLDING MACHINES
CORE BLOWERS BRUSHING MACHINES
INDUSTRIAL BRUSHES

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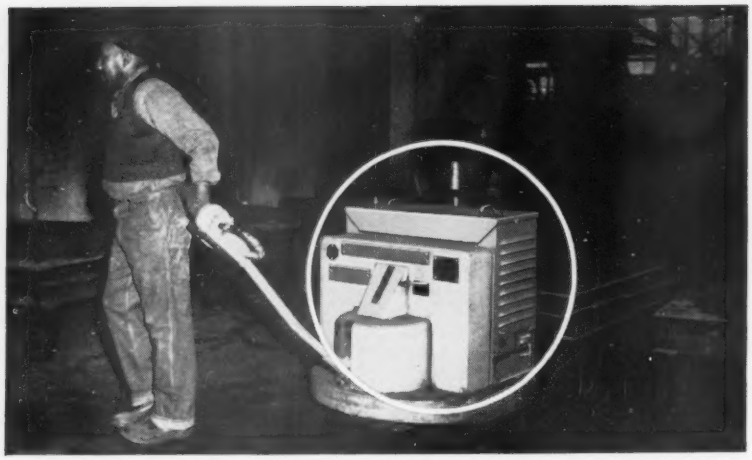
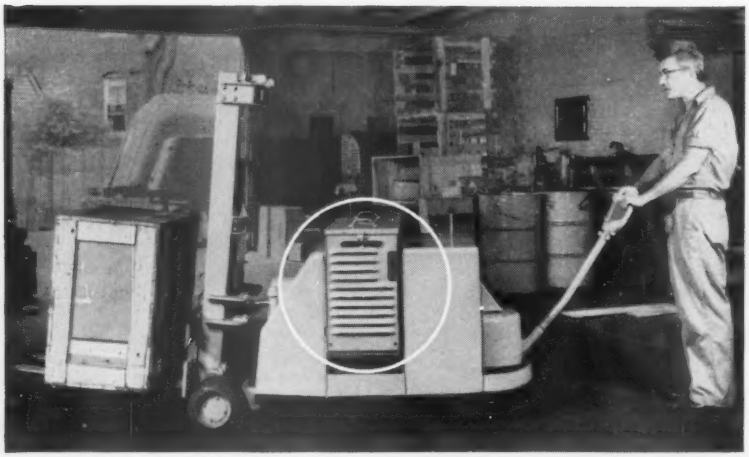


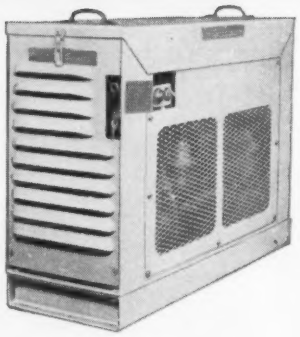
The Most Versatile Power Unit Ever Developed For Small Trucks

READY-POWER BANTAM MODEL W



Only the compact new Bantam Model W provides smooth, dependable gas-electric power that can be quickly interchanged from truck to truck.

A new high-performance unit features 12-volt automotive-type starting and ignition system plus complete choice of idling speed. Full access to engine and generator simplifies adjustment, even on the truck. Fits practically all makes of walkie and rider trucks up to 2000 lbs. *Write today for full information.*



READY-POWER

The READY-POWER Co., 3819 GRAND RIVER AVE., DETROIT 8, MICH.

Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks

face increasingly severe competition from an increased number of more efficient competitors, and some will end up in receivership. More than 800 gray iron foundries alone have closed their doors in the last 10 years, and a good many more are likely to do so before we again see boom times when any foundry can make money.

Of course, strengthening the organization and adopting some of the cost reduction measures listed may mean an increase in fixed overhead —and this increase may involve some reduction in current profit or increase in current losses. This course therefore requires adequate finances and in some instances may require additional financing.

But the many foundries that have gone out of business recently have made one thing increasingly clear: A reasonably high level of efficiency has become necessary for survival, and that level is much higher than it was 10 or even 5 years ago. It will continue to increase as more of your competitors increase their efficiency. So you must make a fundamental choice: Either you get your efficiency up to that level, and somehow raise the necessary capital to do so, or you might as well give up the game now before further losses are incurred.

I have mentioned some of the cost-reduction measures foundries should undertake if they have not done so already. Now I want to discuss some of those points in more detail.

The most important factor in efficiency is a high-caliber organization, and the key man in any organization is the chief executive. In some foundries, the chief executive

"You guys want to make a little overtime—or you want to waste your lives playing ball?"

HANSBERG *Shooters*®

INCORPORATED
3212 CENTRAL STREET
EVANSTON, ILLINOIS, U. S. A.

P. O. BOX 729
CABLE ADDRESS "HANSHOOTER"

To the Foundrymen
of America

It is my great pleasure to announce the incorporation of Hansberg Shooters Inc. of America.

This new corporation will have its head office at Evanston, Illinois, and it has been my privilege to appoint Mr. William Geisler as President of this corporation in charge of all business carried on in America.

Those of you who have met Mr. Geisler, I believe, will agree with me in my wise selection of a man fully qualified to carry on these duties.

This new corporation, as of August 1, 1958, will assume all responsibilities for the sales, importation, manufacturing and servicing of all Hansberg Shooters in America.

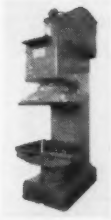
The Hansberg Shooter line consists of 18 models including some CO_2 equipment, roll-over stripper and turntable model machines for core and molding production. This line will provide American foundries with the advanced proven method of making precision cores and molds more efficiently.

A complete inventory of Hansberg Shooters, all accessories, and replacement parts will be maintained at a Chicago warehouse. All Hansberg Shooters sold and installed in America, including those purchased in the past two years, will be serviced from our head office at Evanston, Illinois.

We are pleased to make this announcement which we believe will prove of vital importance to all American foundries.

Sincerely yours,

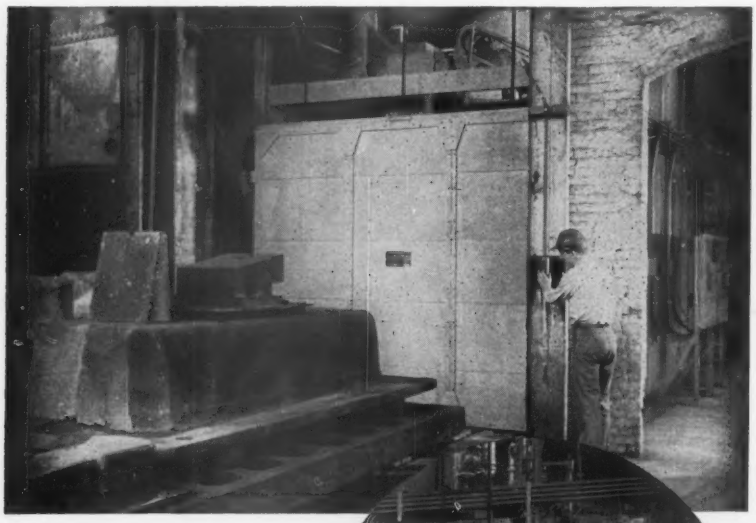
Fritz Hansberg
Chairman of the Board



Circle 602 on Page 119

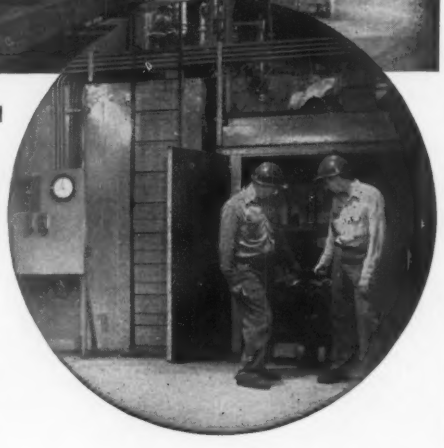
here's another **carl mayer** installation...

Cutting Costs for its Owner



CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.



RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

Heat loss is reduced up to 1/3, and fuel savings up to 50% over old conventional methods are possible. Temperature uniformity is guaranteed.

Consult Carl Mayer now for any type foundry oven or furnace, large or small, and for any purpose. Write for Bulletin 53-CM.

THE **carl mayer** CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

has been one of the chief obstacles to progress. He has run the foundry on old fashioned lines for many years. Perhaps he made a good deal of money in previous years, when conditions were different, and refused persistently to approve any of the "new-fangled" ideas of his younger, more progressive subordinates. But a severe recession, perhaps involving serious financial losses, may change his attitude. I know of a number of instances in which this has happened recently.

A severe recession also is a time for a critical appraisal of the whole management organization. If it needs strengthening in any respect, this is the time to do it! Many foundry organizations are short on men with real foundry engineering or industrial engineering backgrounds.

Progressive foundries—small as well as large—today are using more metallurgists, foundry engineers, technicians, and other men with an engineering background who know how to use the engineering approach to foundry problems. Good men of this type always are difficult to locate, but there is a much better chance of finding them during a recession than in busy times.

Some foundries which cannot afford a full-time foundry engineer are using consulting foundry engineers. These consultants not only help them to lick special problems, but also to train their organization and plan necessary changes.

Increasing Production—The factors listed as favorable to increasing production during a recession included increased availability of management time and greater willingness of employees to do a full day's work.

This combination of favorable conditions should be utilized fully. It obviously is a good time to establish production standards and to get production up as close to them as possible on a time-work basis or to install incentive systems. It is also a good time to install equipment which may involve either of the following: 1. Increasing production or decreasing piece rates on jobs formerly made by hand or on less efficient machines. 2. Using helpers for work formerly done by journeymen molders.

In addition, check every job in the shop to see whether production can be increased by better methods, rigging, pattern equipment, etc., and by getting the molder to produce a fair day's work.

One of the simplest projects that can be given attention during a re-

Circle 603 on Page 119

ACCO for Better Values

SPEEDY SLING SERVICE with ENGINEERED SAFETY!

ACCOLOY® KUPLEX SLING CHAINS

Quick Service from Distributor's Stock!

• Your nearby ACCO Authorized Sling Chain Distributor now offers a new sling service that saves time and money for you. This is made possible by American Chain's sensational, newly-designed **ACCOLOY KUPLEX Sling Chains.**

SAFE, STRONG, STREAMLINED

These slings are the *latest and greatest development* in sling chains. All parts in each leg are manufactured *exclusively* by American Chain, of the same alloy, and engineered to be as strong as the chain itself. They are of a streamlined design that reduces the possibility of catching or snagging.

Finally the component parts are factory proof-tested to twice the working load limits—your assurance of maximum strength and safety.

Another valuable feature: all parts remain visible for easy, periodic wear inspection.

TWO STYLES—SIX SIZES

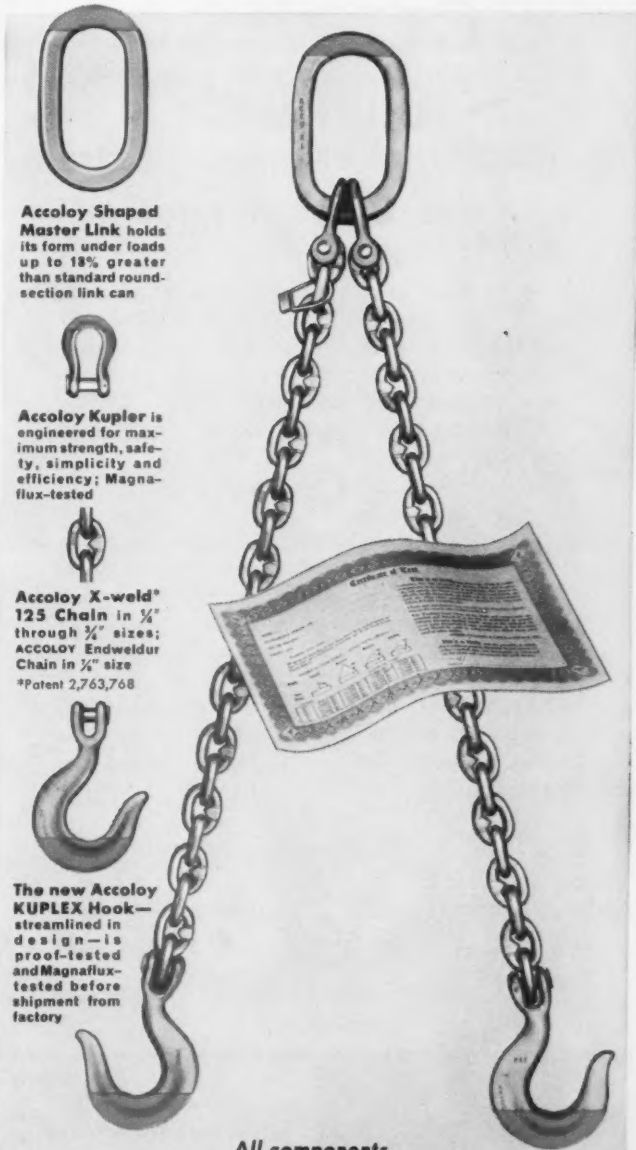
The new ACCOLOY KUPLEX Sling Chains are available in single-leg and two-leg styles and in six chain sizes, from ¼" through ⅞". All chain is made of Accoloy 125 material. All component parts of each assembly are marked and easily identified as to the size of chain with which they are to be used. Components are *color-marked in* orange for easy identification.

CERTIFICATE OF TEST, issued by ACCO and signed by your Authorized Distributor, is furnished with each sling shipment.

GET THE COMPLETE STORY

You will find it to your advantage to get the full story of ACCOLOY KUPLEX Sling Chains. Learn how promptly they can be serviced . . . how easily repairs or parts replacement can be made, should they ever become necessary . . . and how you can benefit from this Great New Distributor Service and this Great New Sling Chain.

Write for **Folder DH-39** and name of nearest ACCO Authorized Sling Chain Distributor.


Accoloy Shaped Master Link holds its form under loads up to 18% greater than standard round-section link can
Accoloy Kuplor is engineered for maximum strength, safety, simplicity and efficiency; Magnaflux-tested
Accoloy X-weld* 125 Chain in ¼" through ⅞" sizes; ACCOLOY Endweldur Chain in ¼" size
*Patent 2,763,768
The new Accoloy KUPLEX Hook—streamlined in design—is proof-tested and Magnafluxtested before shipment from factory
All components
PROOF-TESTED and COLOR-MARKED for easy identification

American Chain Division

AMERICAN CHAIN & CABLE

Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

Indicates Warehouse Stocks

ACCO TRADE MARK

Circle 604 on Page 119

CORES BY THE SCORES

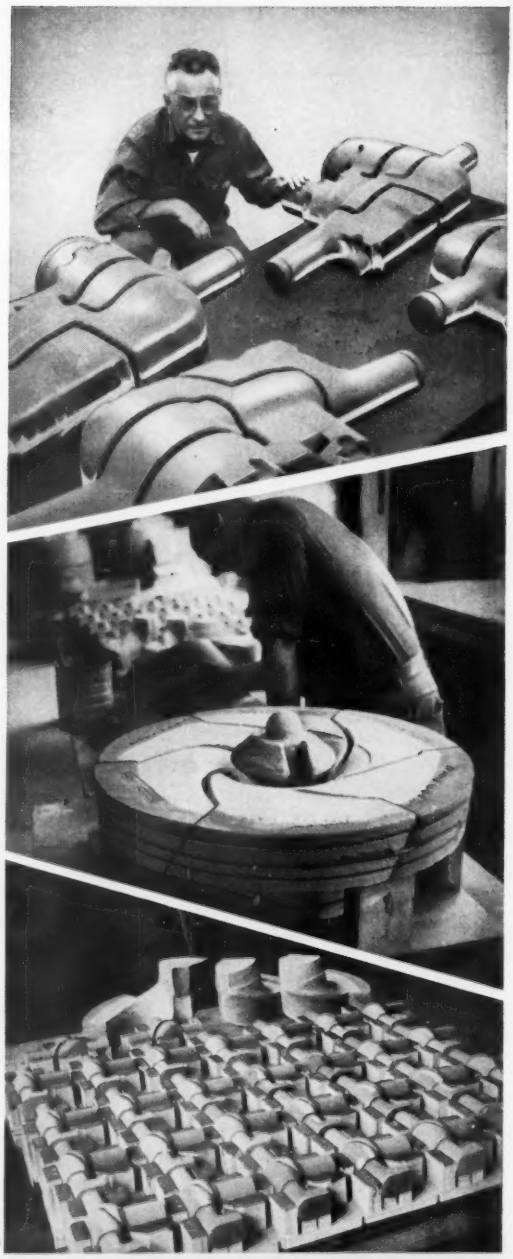
Ampco® makes most of them with one Cities Service oil!

50,000 pounds of castings is all in a day's work at the foundry of Ampco Metal, Inc., Milwaukee, Wisconsin. And these castings may range from a few ounces up to 16,000 pounds each . . . **yet the cores for over 50% are made with one oil—Cities Service Delco #942!**

A talk with Adolph Klamrowski, foundry foreman would tell you why.

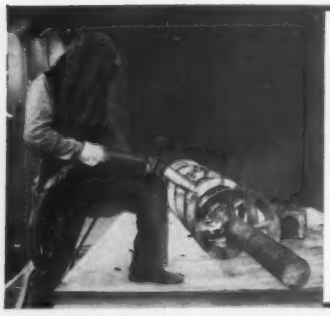
Klamrowski says that this one Cities Service oil can stand the long baking necessary for large cores and also has the necessary properties for small cores. In addition, Delco #942 emits a minimum amount of smoke and due to its shakeout properties prevents sand from sticking in the core boxes.

Regardless of the size or complexity of the cores you make in your operation, chances are one or two Cities Service Core Oils can do the job. Get the facts from a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Ill.

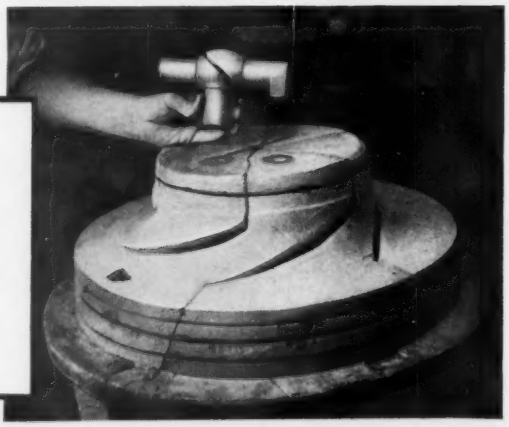


CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Castings from 6 ounces to 16,000 pounds are produced by Ampco for practically every conceivable use, including steel mill screw-down nuts, high pressure pump components and heavy turbine parts.



Circle 605 on Page 119

cession is a change in layout. Desirable layout changes may not have been made when the shop was running 5 days a week with a full crew because the change would have involved the loss of badly needed production. But when the shop is running only 3 or 4 days a week, it is an ideal time to make such changes.

Management has time to plan them, men are available to work on them, and it will give work to some men who would otherwise have to be laid off. The work can be done on off days without interfering with production and without overtime. If no layout improvements have been planned, a survey may reveal some that would be desirable.

The policy recommended in this article is to take full advantage of the special conditions which exist during a recession to put into effect cost-reduction measures that will improve efficiency, even though they may involve an increase in fixed overhead.

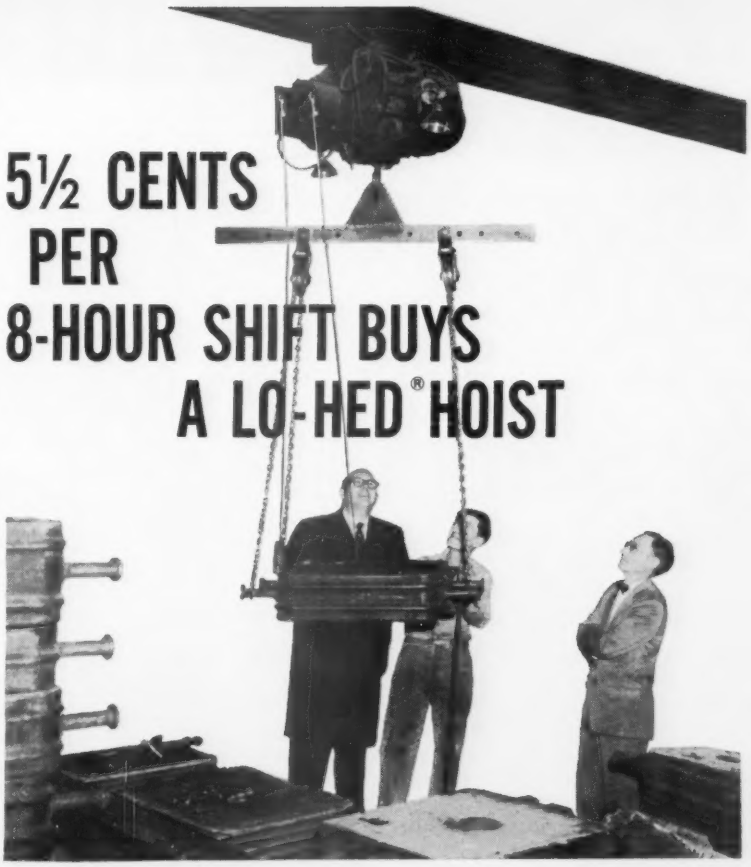
Some foundries follow a policy almost the direct opposite: Their main objective seems to be to cut fixed overhead to an absolute minimum, no matter how much efficiency may be reduced. It is desirable to reduce supervisory and clerical workers to the extent that this can be done without sacrificing efficiency, but to go farther is shortsighted. A recession is a time to improve efficiency.

Gray Iron Founders' Society Plans for Annual Meeting

Program of the 30th annual meeting of the Gray Iron Founders' Society is being prepared to develop answers to important foundry management problems. The meeting will be held at the Sheraton-Park Hotel, Washington, Oct. 8-10.

The annual business meeting is scheduled for Thursday morning, Oct. 9. Among the program high lights will be a panel session on "An Economic Evaluation of Melting Equipment," a discussion of "Implications of the Aluminum Automobile Engine," and a talk on "Problems in Perpetuating the Closely Held Company." Another discussion subject will be "Dealing with Union Power."

Horace B. McCoy, administrator, Business and Defense Services Administration will address the group Friday morning, and Fletcher Knebel, Washington editor, *Look*, will speak at the luncheon that noon. Annual awards and citations will be made at this luncheon.



5½ CENTS PER 8-HOUR SHIFT BUYS A LO-HED® HOIST

Ed. Boyer, Sales Manager of American Engineering Company's Materials Handling Division, inspects 26-year-old Lo-Hed hoist with James Gift, Molder, and Russell Miller, Purchasing Agent for Dodge Steel Company, Philadelphia, Mr. Miller writes:

"When you first asked if we still had this hoist in use, we were tempted to say no without checking because (1) we like to think our plant is too modern to have anything in it over 26 years old, and (2) it seemed impossible for a hoist to hold together over 26 years in our type of service.

"Therefore, the fact that this hoist is still very much in use in our plant today indicates that it is still considered modern in design and efficient in operation.

"Moreover, as repair part purchases have been very low, it would seem that this hoist still has many more years of useful life left in it."

Lo-Hed Electric Hoists cost less because they last longer

Based on current prices, this Lo-Hed Hoist at Dodge Steel shows a capital cost of less than 5½ cents per 8-hour shift . . . and it looks good for another 26 years of valuable service.

Just give us the details—there's a Lo-Hed exactly right for your job

Lo-Hed's are available with headrooms as low as 11"; capacities ¼ to 12 tons; all control types, two-speed included; 5 suspensions; shrouded bottom block; 2 automatic brakes; anti-friction bearings throughout. They're full load tested, and adaptable to any crane or monorail system. Look in your classified telephone directory under "A-E Lo-Hed Hoists" for your nearest representative.

For helpful information on hoists, fill out and mail this coupon today.

Please send me a copy of your booklet on:

☐ "How to select the proper hoist to meet your needs."

☐ "Five things to consider before you buy that hoist."

Name.....

Position.....

Company.....

Address.....

City..... Zone..... State..... M-173

DISTRIBUTORS AND AGENTS: Distributorships and agencies for Lo-Hed Electric Hoists are available in many parts of the country. If you are interested, call or write Ed Boyer, Sales Manager, A-E's Materials Handling Division.

AMERICAN ENGINEERING COMPANY

Wheatsheaf Lane and Sepviva Street

Philadelphia 37, Pennsylvania

Branch Offices: Jersey City • Cleveland • Chicago

Canadian Subsidiaries: Affiliated Engineering Corporations, Ltd., Montreal, P.Q. • Bawden Industries Ltd., Toronto, Ontario

AE Products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries

Industry Briefs

AMERICAN ZINC INSTITUTE, New York, reports that use of zinc diecastings in the automotive industry increased progressively from about 43 lb per car in 1950 to about 64½ lb in 1957. The average per unit in 1958 models is believed to be at least as high as it was for 1957 cars.

Air Heaters Inc. is a new engineering firm which will design and produce special air heating systems for industry. It was formed by Arthur A. Olson, heating engineer; T. F. Schilling and John Wemhoff, principals of Manufacturers & Fabricators Inc., Elyria, Ohio; and Lee Wilson, founder of Lee Wilson Engineering Co., Cleveland. The company maintains offices in Youngstown and Elyria, Ohio.

New Jersey Zinc Co., New York, has completed the first phase of a research and engineering program to assure the company's future production of spiegeleisen. Employing the principles of its recently developed Sterling Process (electric arc furnace), the company has designed a new furnace for the recovery of manganese and iron from its ore deposits at Ogdensburg, N. J.

Carborundum Co., Niagara Falls, N. Y., has authorized new plant facilities in Niagara Falls estimated to cost about $6 million. The new plant will produce 4 to 14-in. vitrified grinding wheels. Additional new facilities for the manufacture of other vitrified product lines will be built later.

Pyrometer Co. of America has been formed in Penndel, Pa., to manufacture instruments, thermocouples, and accessories. It plans to concentrate initially on production of a complete line of standard pyrometric accessories.

J. I. Case International S.A., a wholly owned subsidiary of J. I. Case Co., Racine, Wis., has completed acquisition of majority stock interest in Societe Francaise Vierzon, Vierzon, France, one of the major French manufacturers of farm equipment. The Vierzon operation covers 42 acres of land with 675,000 sq ft of manufacturing facilities, including its own foundry operation. Case plans to expand the French operation by the addition of its own farm and industrial equipment.

Garrett Supply Co., a division of Garrett Corp., Los Angeles, has added the Chisholm-Moore line of hoisting equipment to its stock.

States Engineering Corp., Fort Wayne, Ind., has appointed Shallway International Corp., Los Angeles, to promote and sell Ringlift foundry sand conditioners on a worldwide basis.

W. W. Sly Mfg. Co., Cleveland, has appointed Danforth & Cunningham, 25 E. Quaker St., Orchard Park, N. Y., as Buffalo district representative. T. H. Danforth, for the last six years in dust collecting, conveying, heating and process equipment sales, and D. Michael Cunningham, formerly associated with Carrier Conveyor Corp., Louisville, Ky., have formed the new partnership.

Crandall Engineering & Mfg. Inc., Vicksburg, Mich., recently acquired by Wheelabrator Corp., Mishawaka, Ind., will be known as the Techline Division of the latter company. With headquarters at Vicksburg, the new division will manufacture and sell precision finishing equipment, including barrel finishing machines and wet blast equipment.

Eastern Gas & Fuel Associates, Boston, has begun construction of an addition to its research laboratory in Everett, Mass., to permit a substantial increase in the company's testing program in coal and coke research. The addition will nearly double the size of the original laboratory.

John Morrell Mfg. Co., Elgin, Ill., has appointed the following representatives: John P. Herrington & Associates, 15336 W. Warren Ave.,

STUDY VACUUM METALLURGY: Students studying metallurgical and nuclear engineering at Cornell University, Ithaca, N. Y., will learn techniques in vacuum melting and refining with the help of a new Stokes induction-heated, vacuum melting and refining furnace. Students shown above got a preview look at the new unit when they toured the Stokes plant in Philadelphia recently. The furnace is a Model 437 "package" furnace complete with its own vacuum pumping system, 30-kw induction power supply, and a crucible capable of melting and pouring 17 lb of metal. It was purchased with an AEC grant

Only COLEMAN TOWER® OVENS
provide all these major advantages

INCREASE PRODUCTIVITY

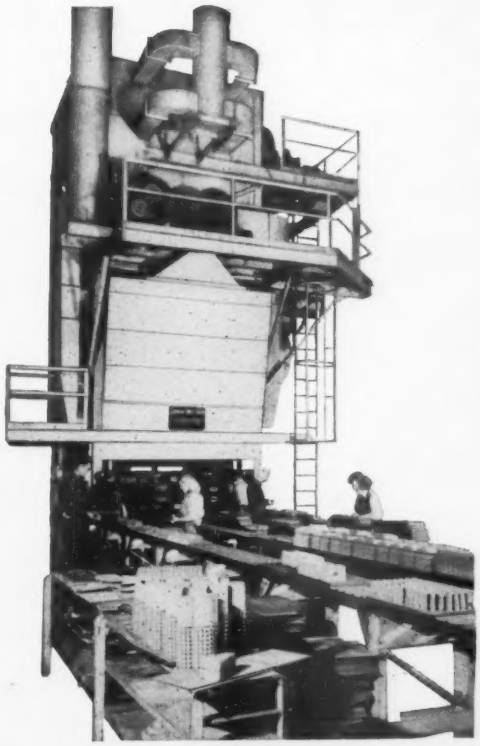
Savings through consistent, dependable production of perfectly baked cores; eliminating rejects, makeovers and casting losses due to improper core baking.

SAVE SPACE

Vertical design permits saving of approximately 75% of floor space over batch ovens of the same capacity. Cores are "smoked-off" and cooled before leaving unloading station.

REDUCE MAINTENANCE

Heavy duty construction for continuous, dependable performance and economical operation reduces maintenance cost to a minimum.



Coleman Tower ovens use only 25% of floor space required by batch type ovens of same capacity.

SAVE TIME

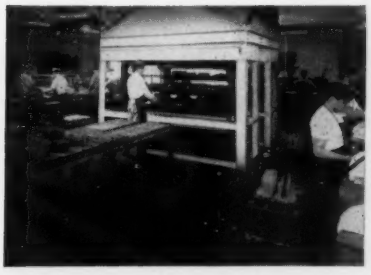
Cores of widely different sizes and shapes can be handled at the same time, all baked with consistent uniformity. Trucks, racks and money-wasting handling methods are eliminated.

SAVE BINDER

Proper core baking atmosphere and uniform temperature provide sizeable savings in conventional or high speed binders.

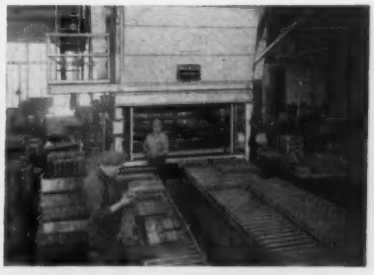
SAVE FUEL

The recovered heat is used over again, thus yielding important fuel saving. The most economical fuel available to you can be conveniently used.



Patented Open Center permits close, efficient grouping of coremakers around the oven... results in increased coremaker productivity.

3-way loading feature increases accessibility 300% over ordinary vertical oven designs.



Recuperative cooling system "smokes-off" and cools the cores before they reach unload station.

Coleman Tower Ovens are the most widely used continuous core baking ovens in the foundry industry. They have brought the advantages of mechanization to large and small foundries and have made important cost reductions. Why not find out whether Coleman Tower Ovens can bring the same savings to you? Our engineers are available without obligation to make practical recommendations for your particular requirements...call or write today!

WRITE FOR BULLETIN 54

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Circle 607 on Page 119

SAVE

WITH *Acme*

MELTING POTS
INGOT MOLDS

Designed by
FOUNDRYMEN...
for FOUNDRYMEN

You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States.
Write for size list showing 40 standard sizes.

Acme **FOUNDRY CO.**

2502 22nd St. • DETROIT 16, MICH. • *Phone* TAshmoo 5-2404

Dearborn, Mich., for Michigan and Ohio; Storage Equipment, P. O. Box 1384, Opa-Locka, Fla., for southern Florida; Hooper-Green Co., 407 S. Dearborn St., Chicago 5, Ill., for eastern Iowa, northern Illinois, and Indiana; Technical Product Co., 369 Lexington Ave., New York 17, N. Y., for metropolitan New York; and Pirie Industrial Products Co., P. O. Box 244, Jenkintown, Pa., for eastern Pennsylvania, southern New Jersey, and Delaware.

Canada Iron Foundries Ltd., Montreal, has purchased C. W. Carry Ltd., Edmonton, Calgary Structural Steel Ltd., Calgary, and Western Bridge & Steel Fabricators Ltd., Vancouver.

Electric Steel Foundry Co., Portland, Oreg., has been appointed exclusive sales representative for the Foundry Division, Hills-McCanna Co., in 11 western states. Esco will distribute Hills-McCanna's magnesium and aluminum alloy castings incorporating the McCannacore process.

Thomas J. Riggs Jr. & Associates Inc. is a new management consultant firm formed in Cleveland to serve industry in Ohio, Michigan, and Pennsylvania. Headquarters of the firm are in the Union Commerce Building, Cleveland. The company was established by Thomas J. Riggs Jr., who recently resigned as executive vice president of Gabriel Co.

American Air Filter Co., Louisville, plans a $\$3/4$ million addition to the 25th Street plant of its Herman Nelson Div. in Moline, Ill. The new structure will contain 76,800 sq ft of floor space and will increase present facilities by about 50 per cent. Occupancy is expected before summer, 1959.

Metal Treating Institute members had billings of $2,989,400 during June, or 20.6 per cent less than for the same month last year. Billings for the first six months of 1958 are down 26.6 per cent from those for the same 1957 period.

Borden Chemical Co. has started production of Epiphen modified novolac epoxy resins in a recently completed plant at Bainbridge, N. Y.

Pape Foundry Inc., 208 Lafayette St., New York, N. Y., has been granted a charter of incorporation listing 200 shares of capital stock of

Circle 608 on Page 119

There is one small muller ENGINEERED AND BUILT for Quality!

SAVES MONEY ON EVERY MULLING JOB—molding sand, facing sand, core sand, CO_2 sand, cold-setting sand, coated shell sand.

SHORT TIME CYCLES—for maximum develment of physical properties of any mixture.

AERATION DURING MULLING—sand mulled in suspension between rubber-tired wheels and rubber-lined bowl.

REALLY COMPACT CONSTRUCTION—only 36" diameter base—56" high. All working parts fully enclosed and protected.

LOWEST COST OPERATION—assured by high quality "production muller" construction. Built for long service and low maintenance.

MULLTROL—the perfect control for smaller muller operation. Assures batch uniformity and precision in the new MULL-ALL

BUILT BY BEARDSLEY & PIPER TO HANDLE EVERY MULLING JOB WITH SPEEDMULLOR EFFICIENCY

The new low-cost **MULL-ALL**

PROGRESSIVE FOUNDRIES LOOK TO BEARDSLEY & PIPER FOREMOST DEVELOPER OF FOUNDRY MACHINERY

FEMA

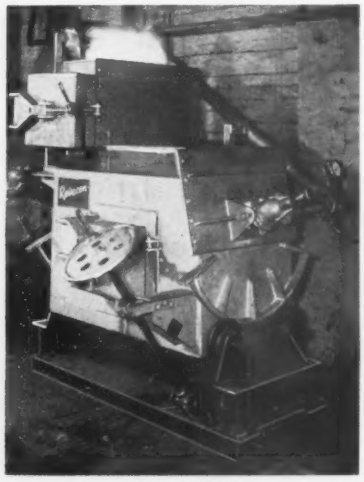
Beardsley & Piper Div. Pettibone Mulliken Corp. 2424 N. Cicero Ave., Chicago 39, Illinois

Circle 609 on Page 119

REVECON

furnaces

CAN SAVE YOU 50% OF YOUR MELTING COSTS



BECAUSE . . .

REVECON

- **operates without crucible**
- **uses a new furnace construction principle**
- **operates on 1/3 fuel usually needed**
- **melts in 1/3 the usual time**
- **eliminates 2/3 of the usual melting loss**
- **eliminates contamination often incurred when changing heats**

Non-crucible melting furnaces that update the efficiency of your foundry operation. Oil, gas or coke fired. A size for every foundry need: 50 lbs. to 5 ton capacity.

Reverbale and Y.M. dip-out furnaces available for permanent molders.

Today, write for our free booklet

"EFFICIENCY IN MELTING THE REVECON WAY

INTERNATIONAL Foundry Supply Co.

P. O. Box 1053, Reading, Pa.
Demonstration Plant: 330 Water St. Reading, Pa.

Canadian Representatives: Drew Brown Ltd. 5410 Ferrier Street, Montreal 9

Circle 610 on Page 119

no par value. Directors are Sydelle Prober, Beverly Greenberg, and Albert J. Solomon, all of 11 Park Place, New York, N. Y.

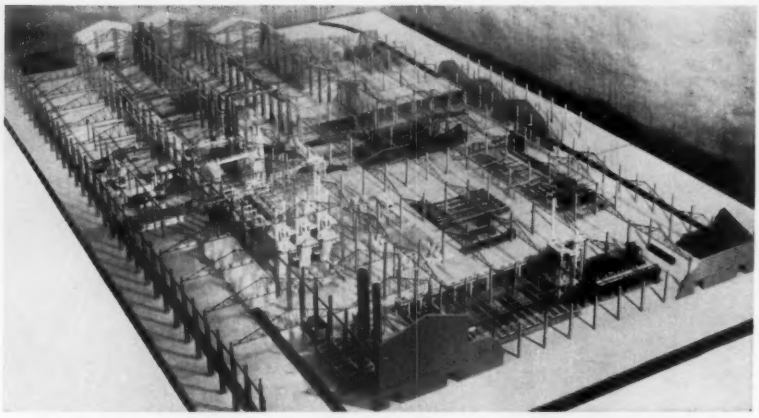
A. P. Green Fire Brick Co., Mexico, Mo., has acquired Stevens Fire Brick Co., Macon, Ga., by an exchange of common stock. Stevens is a producer of Georgia-type super, high, and medium-duty brick. Robert McIntosh will manage the Stevens operation.

Industrial Heating Equipment Association Inc., Washington, reports that June net new orders for industrial furnaces totaled $3,672,000, up substantially from the low volume in May and considerably higher than the $2,967,000 average for the first six months of 1958.

Pacific Car & Foundry Co., Seattle, has acquired the Peterbilt Motors Co., Oakland, Calif., manufacturer of heavy-duty trucks.

Continental Light Alloy Co., foundry, New York, has been granted a charter of incorporation with capital stock of 200 shares of no par value. Directors are Irving G. Wolff, Benjamin F. Steinberg, and Alexander Preiser, all of 100 Fifth Ave., New York 11, N. Y.

Argentina Gets Large New Foundry



Modern design is incorporated in South America's largest iron foundry

THIS scale model shows the layout of South America's largest gray and malleable iron foundry. Designed by the Lester B. Knight International Corp. for Acindar, S. A., the largest steel producer in Argentina, the newly built foundry is situated on property adjoining the steel mill on the Parana River at Villa Constitucion, Argentina.

Castings produced in the modern 340,000-sq-ft foundry include chilled iron car wheels, automotive cylinder blocks, malleable pipe fittings, ingot molds and mill rolls, and miscellaneous gray iron and malleable iron castings for automotive, farm implement, and railroad use. Eventual annual capacity is 75,000 tons of castings. Among the principal users of these castings are South American plants of Kaiser, Fiat, John Deere, and Borgward.

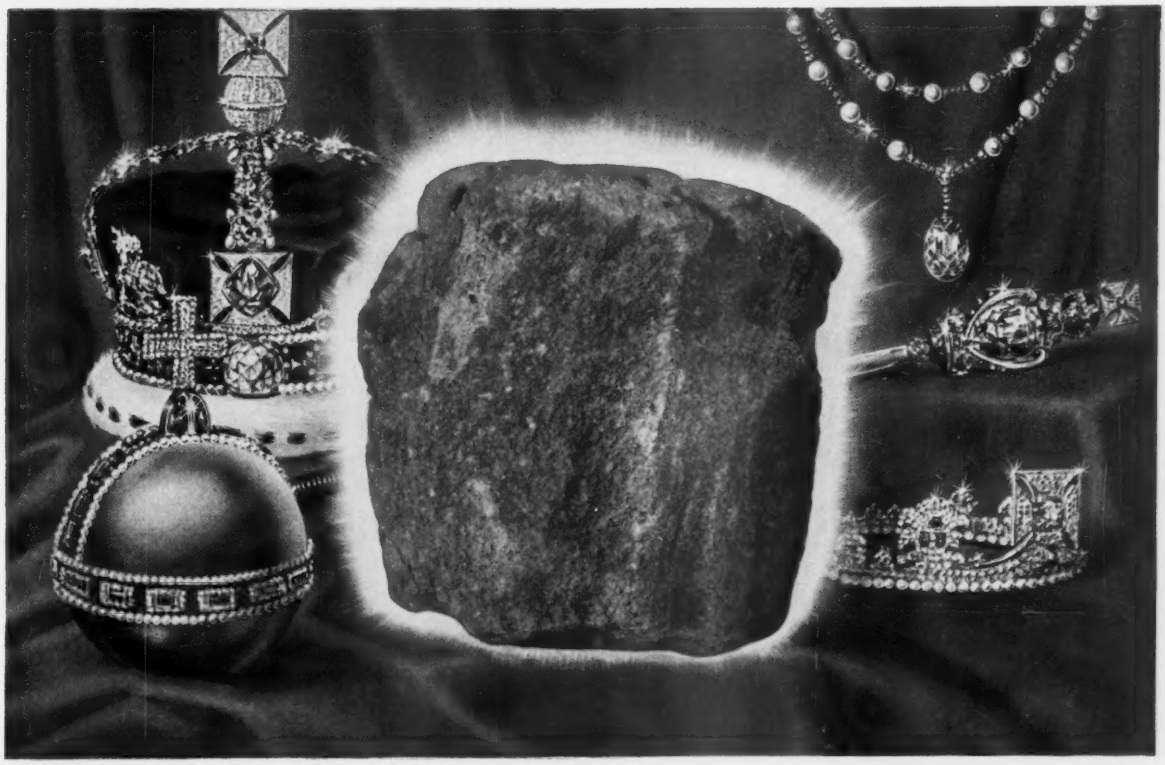
Melting equipment includes two hot-blast cupolas each with a capacity of 22 tons per hour, two 15-ton, cold-batch air furnaces, and a 12-ton air furnace used in duplex melting of malleable iron.

The foundry is mechanized to attain high productivity, and an efficient smoke and dust control system helps to provide good working conditions.

In addition to designing the foundry and supervising installation of facilities, the Knight organization furnished a team of six U. S. foundrymen to operate the plant while training the Argentines to take over. L. A. Dunn, formerly with General Electric, is foundry manager. V. E. Gammon and Horace Weston, recently with International Harvester and J. I. Case, respectively, are superintendents.

Arturo F. A. Acevedo is president of Acinfer, S. A., the foundry organization.

This plant received an award for the "outstanding industrial plant for 1958 in Argentina."



Valuable asset...ACCESSIBILITY

One of our most prized "possessions" is our *accessibility*—the strategic locations of Semet-Solvay's coke plants and coal mines.

A glance at the accompanying map will show you exactly how close you are to a supply of high quality Semet-Solvay Coke. Chances are that one of our plants or sales offices is in your "backyard." Hence it follows that you can be assured of a convenient, dependable supply of Foundry Coke when you do business with Semet-Solvay.

Semet-Solvay is the *only* merchant Coke producer operating four By-product Coke plants ready to supply all the high quality Foundry Coke you need *when* you need it! Its facilities include 700 ovens, 3 coal mines and a fleet of barges and diesel boats. And *you* get first call on our output—we have *no* prior commitments to others.

In addition to accessibility, the purchase of your Foundry Coke from Semet-Solvay has many other advantages: Quality and uniformity of product are tops because of Semet-Solvay's continuous and exhaustive research program. Availability is constant, thanks to Semet-Solvay's extensive productive facilities. Five coke sizes are available to meet the requirements of all sized cupolas and melting practices. And last but not least, we offer advice—a free metallurgical service department staffed by specialized technicians. Their advice is yours for the asking.

Call your Semet-Solvay office today or write us direct for the *complete* story on Semet-Solvay Foundry Coke. You'll find it both interesting and profitable.

STRATEGIC LOCATIONS

For Better Melting . . .

SEMET-SOLVAY DIVISION

DEPT. 520-BH, 40 RECTOR STREET, NEW YORK 6, N. Y.

Buffalo • Cincinnati • Cleveland • Detroit

In Canada: ALLIED CHEMICAL CANADA, LTD., Semet-Solvay Dept., Toronto

Western Distributor: WILSON & GEO. MEYER & CO. San Francisco • Los Angeles

Allied Chemical

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SHAW PROCESS FOUNDRY

Provides Economies for Tool Shop

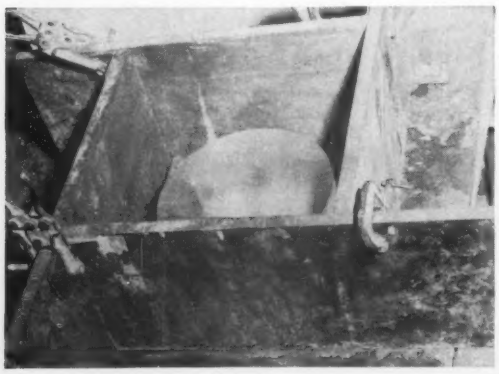
By ROBERT H. HERRMANN
Associate Editor

Patternmaker uses small file to touch up an epoxy resin pattern for half a diecasting die

PERMANENT Mold Die Co., Hazel Park, Mich., recently set up a Shaw Process investment molding foundry at one of its plants. Castings ranging in weight from 1 to 45 lb are poured at that foundry although larger heats have been poured with the co-operation of outside foundries. Management has found that economies are achieved by pouring multiple castings from one pattern. Additional benefits were anticipated and realized on machining costs and in shortening production time, permitting quicker service to customers.

The company makes shell molding patterns, dies for permanent molding and die casting, piston cores, metal mold casting machines, extrusion press tooling, and coilers for tubing. The company's work thus far has been machining and assembling. The foundry operation not only supplements this by providing certain production economies and delivery advantages, but also has opened up new avenues of products in the tool and die field.

In operation for about a year, the foundry has been used primarily to produce permanent mold segments and extrusion dies in both the ferrous and non-ferrous field. Cast surface finishes are in the range of 90-120 microinches which is comparable to a machined permanent mold finish. Dimensional tolerances held are approximately plus or minus 0.001 in./in. on dimensions up to 3 in. Another advantage of castings for permanent molds is that identical mold segment replaceable inserts can be produced economically for high-wear areas of the mold. They are easily replaced, throwaway parts which provide the customer with a flexibility in his tooling without sacrificing economy.

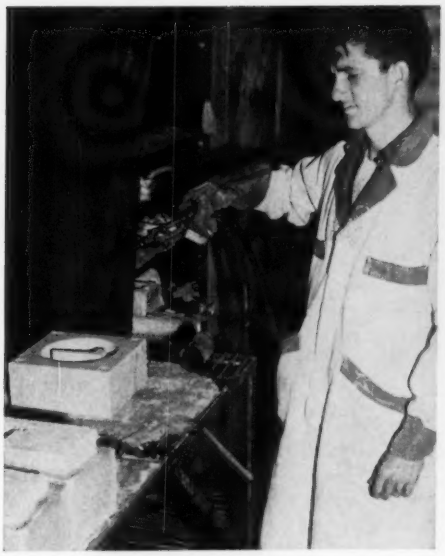


Four metal plates coated with release agent are clamped around the pattern on a base plate to form a flask into which mold-forming slurry is poured

Expand Extrusion Die Market—In recent months the company has been casting dies for extruding stainless steel, zirconium, beryllium, titanium, brass, bronze, aluminum, and magnesium. Previously the company had machined extrusion dies principally for aluminum and magnesium. Since tougher metals difficult to machine can be economically cast to shape, die life in some cases has been increased considerably by a change in die alloy. The increase in life has varied and depends to a great extent on the particular application. These cast die alloys have made high temperature extrusions much more practical.

Cast extrusion dies can be designed for economical reinforcement of thin, weak sections. This is an additional saving over excessive work previously required on certain types of machined dies. Cast die production involves checking the as-cast piece against a master template and polishing the die channels. In some cases a small amount of machining may be required, depending on the accuracy involved. Cast dies and permanent mold parts made in the foundry are heat treated except for cobalt-base alloys and some SAE constructional steels.

Alloys poured in the foundry include chromium and tungsten hot-work steels, tungsten and molybdenum high-speed steel, 300 and 400 series stainless steels, cold work die steels, and cobalt base alloys. A



Cavities of molds stripped from the pattern are fired by acetylene torch prior to oven drying

Slurry is poured around closed molds to a level above parting line to hold halves in position

Most molds are poured by clamping to an indirect-arc tilting furnace and inverting

small amount of aluminum also has been poured.

Melting equipment includes an indirect-arc rocking furnace with capacity for 100 lb of steel and two indirect-arc tilting furnaces with 18 lb steel capacities. The molds are clamped to these furnaces and the assembly inverted to fill the mold cavity. The larger furnace is tapped into a hand ladle for pouring molds.

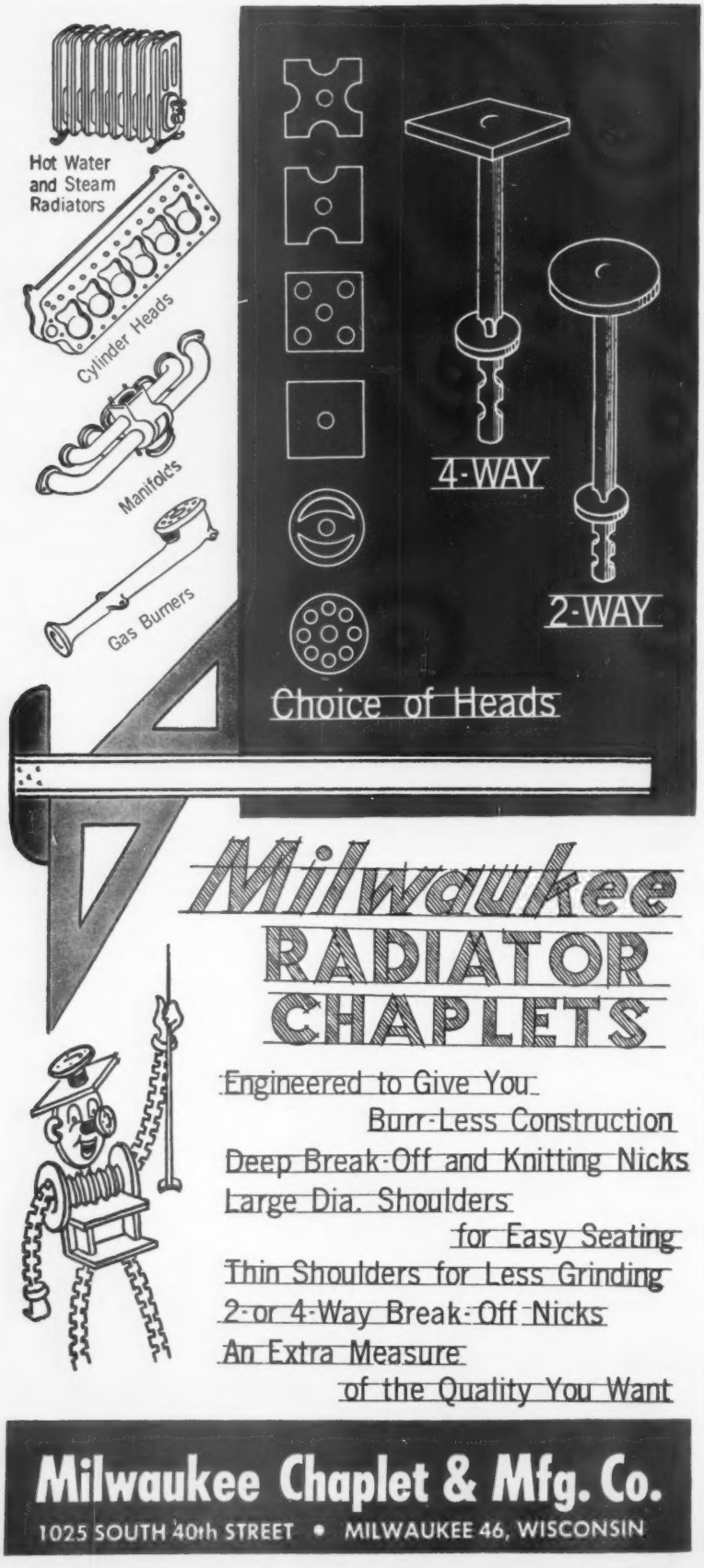
Use Plastic Patterns—Most molds are produced over plastic cope and drag patterns machined in the company's shop. If comparatively long runs of castings are involved, steel patterns are used. A pattern half is placed on a metal plate; both are brush coated with a silicone or wax release agent. Four metal plates coated with release agent and wider than the pattern height are arranged on the base plate around the pattern and clamped in position. Then a slurry is prepared with a suitably graded refractory and a colloidal suspension of silica in alcohol to which a gelling agent has been added.

The slurry is poured around the pattern and allowed to set for a few minutes until it attains a pliable, rubbery state. The time required to attain this rubbery state and the length of time the mold material remains in that stage is controlled by the amount of gelling agent added to the slurry. While the material is rubbery, the plates forming the exterior of the mold are removed and the mold stripped from the pattern. Because of the pliability of the mold, it can be stripped from a pattern which has no draft or, in some cases, from patterns having a slight undercut. Complete elastic recovery occurs so that there is no loss of accuracy or of the high degree of pattern fidelity achieved by the material. Both halves of the mold are made in the same way.

Surfaces of the mold halves are dried with an acetylene torch. In the process, the alcohol in the molds is ignited, thus firing the mass of mold material to form a solid, rigid mold. When the firing action has ceased, the molds are put in an electric oven and dried at 2000° F for 4 to 12 hr, depending upon size.

After the mold halves are removed from the oven and cooled, they are

Poured molds are unclamped from the furnace and set aside to cool



closed, set on the metal plate again and the flask assembled around it, leaving a space of about ½ in. Slurry is poured into the space to a level above the mold parting line. The flask plates are removed and the material fired with a torch. Thus, the mold halves are held together in proper alignment, and the mold is ready for pouring.

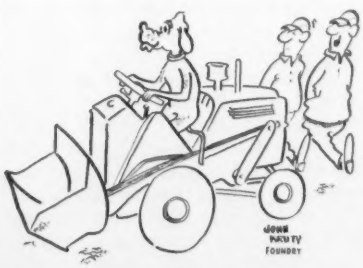
Castings are broken out of the molds with a hammer and cleaned in a small air blast cabinet with 100 mesh grit. Gating metal is removed with an abrasive cut-off wheel or bandsaw.

As stated before, all castings except those of cobalt-base alloys and some SAE constructional steels are heat treated. Three 18 x 24 x 36 in. deep electric furnaces are available for the work. All have controlled atmosphere equipment. Two are used for heat treatment involving temperatures above 1400° F. They also are used for firing the molds. The third furnace is used for tempering and stress relieving below 1400° F.

Malleable Founders To Discuss Research and Marketing

Semiannual fall meeting of the Malleable Founders' Society will be held in Cleveland, Sept. 19, at Hotel Cleveland. The program will include a review of the society's technical and research program and a discussion of future marketing plans.

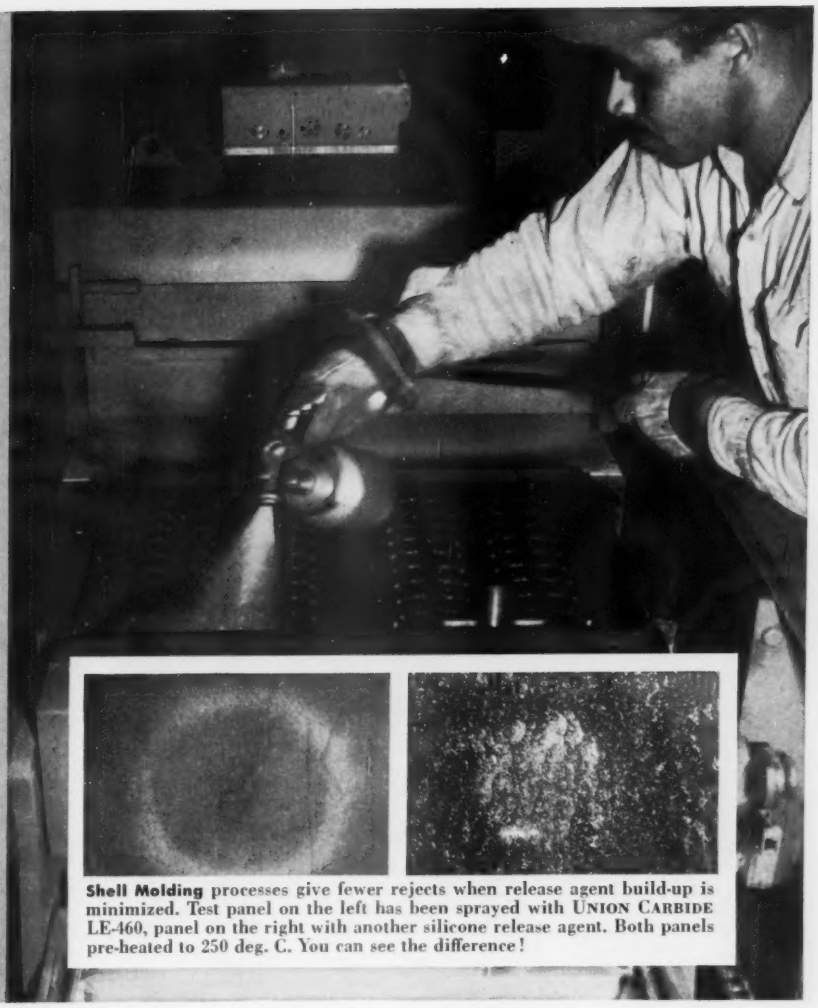
The technical program is one which recently was presented in a paper to the ASTM, including important research on elevated temperature characteristics of malleable iron castings. It is believed that it will lead to many new applications. New information on machining malleable iron castings also soon will be published by the society. It is based on research now under society sponsorship.



"Of course not. He just likes to sit in it"

Data from the
SILICONES MAN

COMPARE THE BUILD-UP of these shell molding parting agents



Shell Molding processes give fewer rejects when release agent build-up is minimized. Test panel on the left has been sprayed with UNION CARBIDE LE-460, panel on the right with another silicone release agent. Both panels pre-heated to 250 deg. C. You can see the difference!

This test shows how the wrong release agents can build up and destroy tolerances in your shell molding process. But UNION CARBIDE LE-460 Silicone Emulsion release agent does not build up. With LE-460 Emulsion you get improved release, fewer rejects. And less time is lost for mold cleaning.

A unique process is used in compounding UNION CARBIDE LE-460 Silicone Emulsion. The result: even dispersal of the active silicone ingredient over the entire pattern surface—even when diluted with water 200 to 1! Water hardness will not cause separation . . . nor will pumping, aeration or repeated freeze-thaw cycles. LE-460 is delivered as a concentrate. You dilute it with ordinary tap water to suit your needs.

Your Silicones Man has a great wealth of information about silicone release agents . . . in the chemistry, properties and many applications of UNION CARBIDE Silicones. Call the UNION CARBIDE Silicones Man today; he has offices in most major cities. Or write for technical literature on "Silicones for the Shell Molding Process." Address Dept. IG-4801, Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

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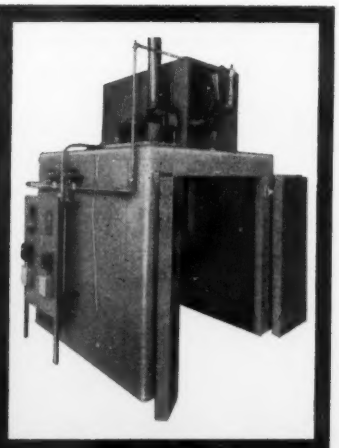
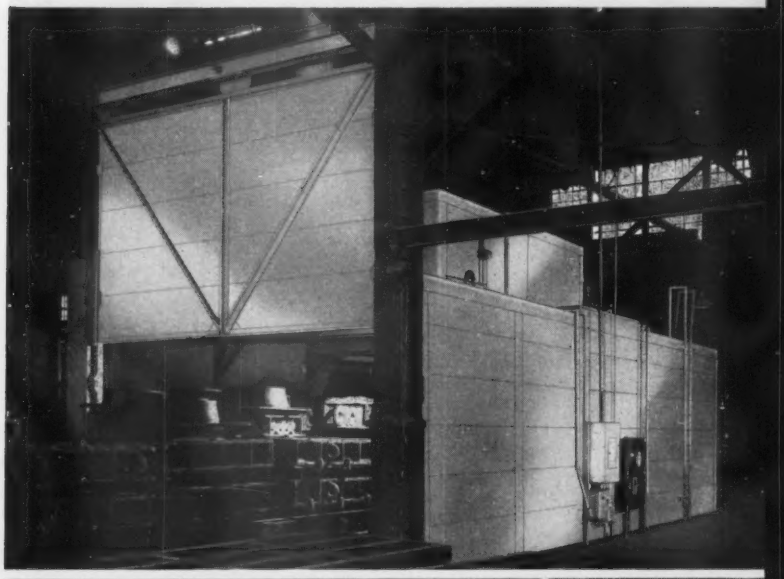
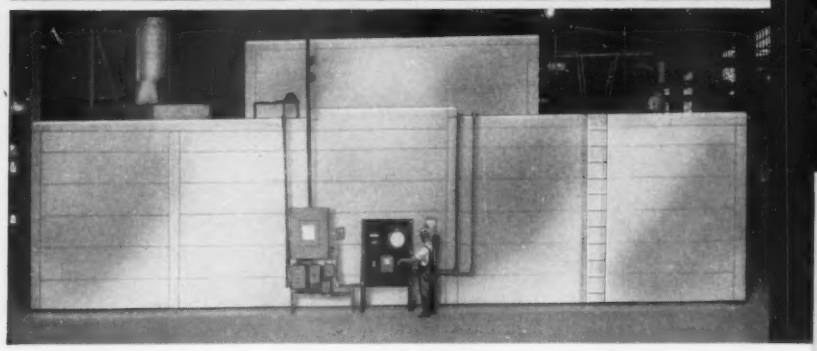
- from Small RACK TYPE OVENS

generally used when the baking of smaller cores is required in the production operation of your foundry.



-to Gigantic CAR TYPE OVENS





when the drying of large molds and cores for bigger castings is required.

This huge installation in the foundry of a large supplier of railroad products efficiently and economically carries its share of the load in the production of better castings.

Consult LANLY for a proposal on foundry ovens before you buy. A check of your present equipment may disclose a fuel eater, a core spoiler or a heat loser amongst them.

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551	566	581	596	611	626	641	656
552	567	582	597	612	627	642	657
553	568	583	598	613	628	643	658
554	569	584	599	614	629	644	659
555	570	585	600	615	630	645	660
556	571	586	601	616	631	646	661
557	572	587	602	617	632	647	662
558	573	588	603	618	633	648	663
559	574	589	604	619	634	649	664
560	575	590	605	620	635	650	665
561	576	591	606	621	636	651	666
562	577	592	607	622	637	652	667
563	578	593	608	623	638	653	668
564	579	594	609	624	639	654	669
565	580	595	610	625	640	655	670
671	686	701	716	731	746	761	776
672	687	702	717	732	747	762	777
673	688	703	718	733	748	763	778
674	689	704	719	734	749	764	779
675	690	705	720	735	750	765	780
676	691	706	721	736	751	766	781
677	692	707	722	737	752	767	782
678	693	708	723	738	753	768	783
679	694	709	724	739	754	769	784
680	695	710	725	740	755	770	785
681	696	711	726	741	756	771	786
682	697	712	727	742	757	772	787
683	698	713	728	743	758	773	788
684	699	714	729	744	759	774	789
685	700	715	730	745	760	775	790
791	806	821	836	851	866	881	896
792	807	822	837	852	867	882	897
793	808	823	838	853	868	883	898
794	809	824	839	854	869	884	899
795	810	825	840	855	870	885	900
796	811	826	841	856	871	886	901
797	812	827	842	857	872	887	902
798	813	828	843	858	873	888	903
799	814	829	844	859	874	889	904
800	815	830	845	860	875	890	905
801	816	831	846	861	876	891	906
802	817	832	847	862	877	892	907
803	818	833	848	863	878	893	908
804	819	834	849	864	879	894	909
805	820	835	850	865	880	895	910

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800	815	830	845	860	875	890	905
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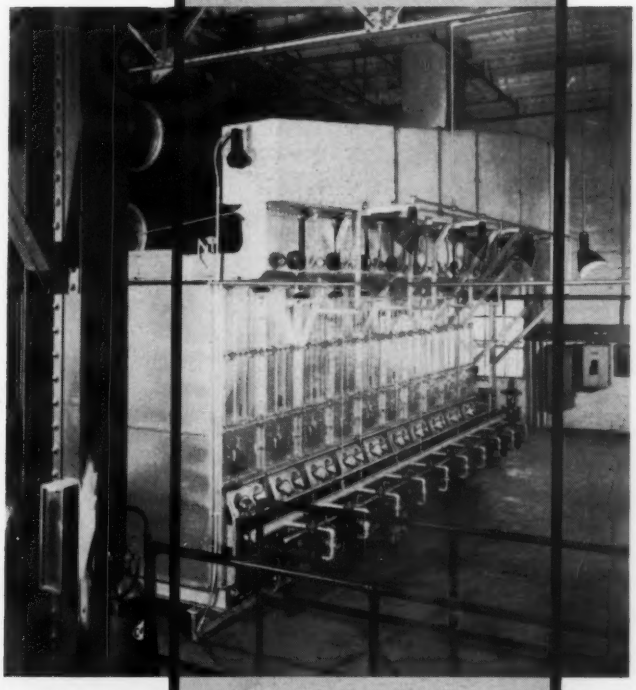

How hot would you want the air going to the cupola? 500 degrees? 1000 degrees?

The ROSS Hot Blast System can deliver hot air in any volume required up to about 1000°F. It is designed with two major variations: (1) for heating the air up to 500°F. and (2) up to 1000°F. Either unit can be tied into your present operations without stopping production. Existing blowers, if correctly rated, can be used.

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While the Hot Blast System makes use of air and there is definitely a conditioning and control problem involved, it is with the CORE OVEN that skill in designing and creating the 'engineered atmosphere' is the major factor. For, Curing Ovens, to be most efficient, must coordinate temperature, air volume and air movement so as not only to provide uniform temperature conditions throughout the oven but to keep temperature drop to a minimum. Only uniformly baked cores can assure maximum production of castings. Wide temperature variations are bad.

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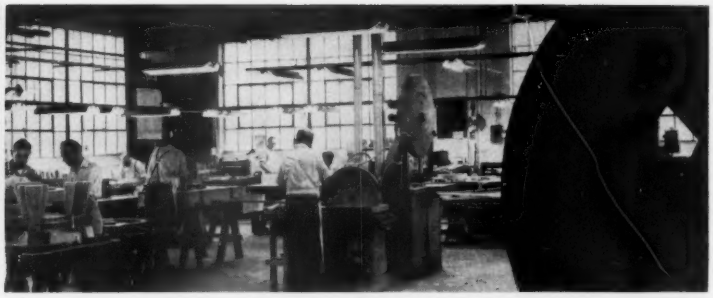
Circle 615 on Page 119

Lumber cut-off and planning area in the woodworking section of the shop



Part of the detailed woodworking area. Large face plate at the right is used in turning patterns up to 84 in. in diam

Drafting and estimating room is located in the office area

NEW PATTERN SHOP

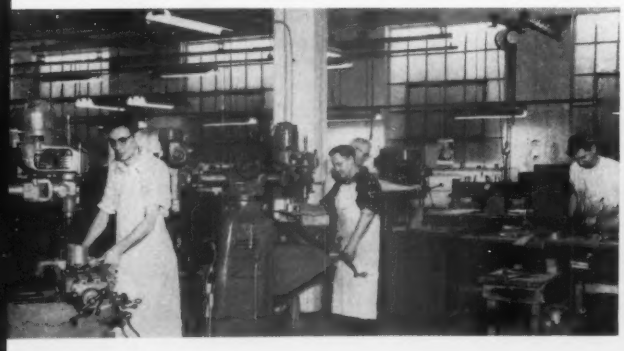
Improves Operation

WELLMAN Bronze & Aluminum Co., Cleveland, which operates two foundries for producing aluminum and magnesium castings primarily for the aircraft and missile industries, recently acquired a separate building into which it has consolidated all patternmaking facilities. Pattern shops had been operated at each of its foundries, but in recent years an increased volume of work had taxed the capacities of each. Co-ordinating work at the two also had become a problem.

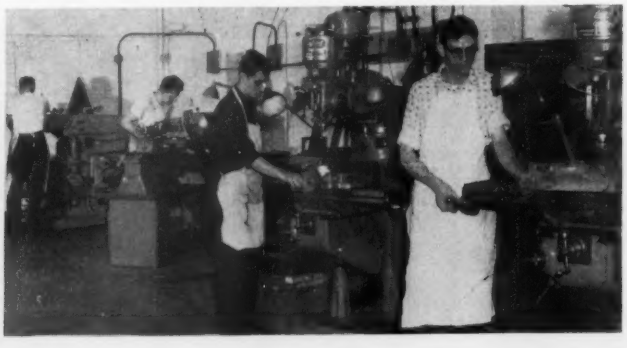
The newly acquired building which consolidates the old operations and incorporates new equipment provides a much improved facility for producing all types of models, wood and metal patterns, and metal dies. Facilities include overhead tram rail hoist equipment, complete dust collecting equipment, and up-to-date lighting. The well laid out shop offers 13,000 sq ft of production space plus storage capacity for 20,000 board feet of pattern lumber.

A view of the bench work area in the metal pattern department

Small metal patterns and coreboxes are produced in this department of the shop



Several pieces of new machinery have been added for the production of metal dies



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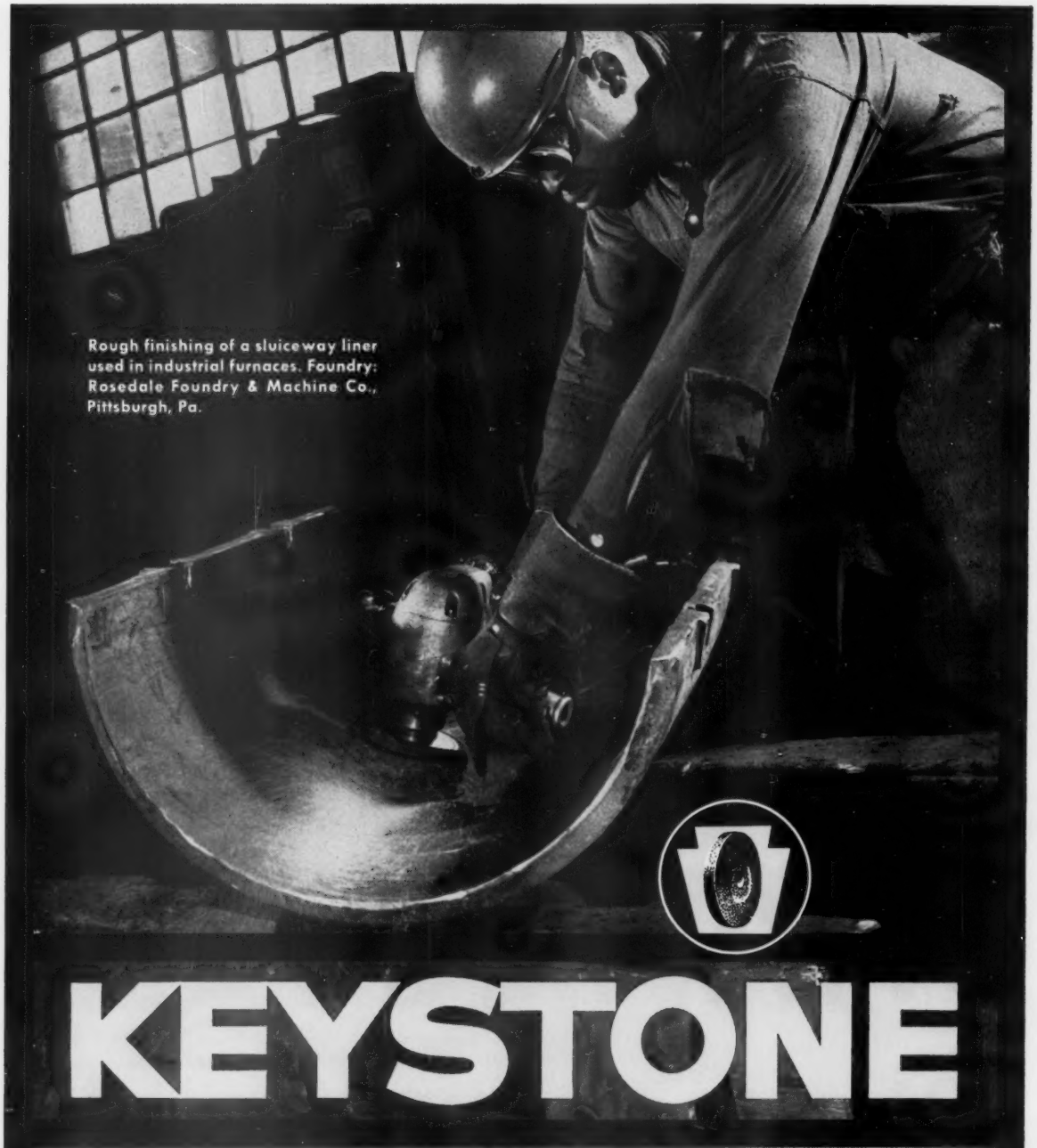

Rough finishing of a sluiceway liner used in industrial furnaces. Foundry: Rosedale Foundry & Machine Co., Pittsburgh, Pa.

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

STANDARD x-ray radiographic film copies for use in evaluating discontinuities in tin-bronze castings have been prepared by the Navy Bureau of Ships, and are available from the Office of Technical Services, U. S. Department of Commerce, Washington 25. The films, which provide bases for comparison with radiographs from actual castings, represent sections of gun-metal bronze plates (Mil-M-16576) cast ¾ in. thick. Radiographs are applicable to sections up to 2 in. thick when medium voltage x-rays or Ir 192 are used as sources.

Five types of discontinuities illustrated are gas porosity, shrinkage, sand inclusions, chaplets and tears. Each of the first three types contains 5 degrees of severity. Examples of acceptable chaplet and unacceptable chaplet are given. One example each is included for a hot tear and a shrinkage tear, neither of which is acceptable. The films are contained in a heavy loose-leaf book and protected by individual plastic envelopes. The film set, PB 131854, "Radiographic Standards for Bronze Castings" may be obtained for $25.

Approves Casting Standard

MOST recent revision of ASTM Standard Specifications for High-Strength Steel Castings for Structural Purposes (ASTM A 148-57) has been approved as American Standard G52.1-1958 according to the American Standards Association, 70 E. 45th St., New York. Determination of the yield point has been added to the revised standard, and minor changes were made in the section covering test specimens. Copies of the standard are available for 30 cents from the association or from the American Society for Testing Materials.

Shocks Models

ASSEMBLY of stainless steel castings in which generated shock waves travel at 17 times the speed of sound is in operation at Lockheed's Missile Division research and development laboratories at Palo Alto, Calif. Principal component parts of the "shock tube" are centrifugal and static castings shown in the accompanying illustration. They were produced by Electric Steel Foundry Co., Portland, Ore. The unit, more than 44 ft long, operates at 2300 psi. Instantaneous temperatures within the tube are said to reach 15,000° F.

Unit is being used for advanced design work on the Navy Polaris ballistic missile. The tremendous temperatures and pressures generated within the tube will simulate those which will be encountered by

a long-range missile as it plunges from space into the earth's atmosphere. Lockheed's scientists will study heat transfer, shock wave shapes and other details of airflow around missile models in the tube. In addition, they will perform basic research in high-temperature gas dynamics.

Metal Protection

UNIQUE pigment composed of a silica core with basic lead chromate fused on its surface has been developed by National Lead Co., New York, for use in metal protective paint. It is reported that the pigment has the rust-inhibitive properties of lead and chromium compounds and the weather resistance or nonchalking properties of fused basic lead chromate. All paint vehicles such as linseed oil, chlorinated rubbers, alkyds, phenolics, epoxies, vinyls, polyurethanes, and water dispersible resins and oils are said to be compatible with the pigment. Material can be tinted readily and can be used in combination with other pigments.

Alloys Are Superior

STUDY by the National Bureau of Standards, Washington, indicates that creep resistance of nickel-copper alloys is superior to that of the parent metals. This conclusion is suggested by results obtained with high-purity nickel and copper, and two nickel-copper alloys. Tests made in tension at elevated temperatures also reveal that the rate of strain-hardening and degree of strain-aging are increased by alloying the nickel and copper. Details are given in RP 2836, "Creep of Annealed Nickel, Copper and Two Nickel-copper Alloys" by W. D. Jenkins and C. R. Johnson, *Journal of Research*, National Bureau of Standards, 60,173 (1958).

Etch and Polish

METALLOGRAPHIC reagents for cobalt and its alloys, and electrolytic polishing of cobalt, are discussed in new instruction sheets entitled "Metallographic Etching Reagents for Cobalt and Cobalt-containing Alloys" and "Electrolytic Polishing of Cobalt." The first supplies information on correct etching solution and method for macroetching or microetching various high-temperature alloys, high-speed steel, sintered carbides, hard facings and pure cobalt with appropriate remarks on each.

Industrial alloys listed include Nimonic 90, Nimonic 100, HS-21, HS-23, HS-25, HS-27, HS-30, HS-31, HS-36, N-155 and S-816. "Electrolytic Polishing of Cobalt" lists eight solutions for use in chemical and electrolytic polishing of various cobalt alloys with information on time, temperature, and voltages required. The publications may be obtained by request on company letterhead from Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Russian Foundry Practice

The abstracts presented here were prepared from articles published in recent issues of the Russian publication *Liteinoe Proizvodstvo (Foundry Industry).*

PERMANENT ALUMINUM MOLDS

Casting Iron in Aluminum Molds. N. B. Pasternak, V. I. Shurupov, A. M. Fedchenko, N. A. Kosenko. *Liteinoe Proizvodstvo*, No. 4, April, 1958, p. 24.

Metal molds operate under conditions of sharp temperature rise of its working surface during the casting of the metal (thermal shock), followed by rapid cooling after the casting. The frequent and sharp changes of temperature in the mold cavity produce volume changes in the mold, giving rise to thermal stresses that produce cracks in the mold surface. This action is intensified further by the effect of corrosion. From this point of view iron-carbon alloys undergoing phase changes in heating do not meet the requirements imposed on the material of metal molds.

Since the application of pure aluminum for metal molds was experimentally found to be unsuitable, an aluminum alloy, AL9, was investigated that had good resistance to shrinkage cracks, sufficient hot strength, high corrosion resistance, satisfactory machinability, and high mechanical properties. Its linear shrinkage of about 1.25 per cent was approximately that of gray iron, and thermal conductivity was 0.36 cal/cm/sec/°C.

The AL9 alloy was melted in an induction furnace with a flux of 55 per cent KCl and 45 per cent NaCl and modified by a mixture of 25 per cent NaF, 12.5 per cent KCl, and 62.5 per cent NaCl. It was poured at 690-710° C into a negative mold heated to 200-220° C and held in the mold for no longer than 15-20 seconds after pouring. It was cooled in the air.

With the AL9 molds of 10-mm wall thickness, castings were obtained having a wall thickness up to 40 mm (1.57 in.) and weighing 5-7 kg (10-15 lb). Composition of the cast iron was 2.45-2.7 per cent C, 2.45-3.4 per cent Si, 0.7-1.0 per cent Mn, 0.25-0.32 per cent P, up to 0.12 per cent S. Under the operating conditions used the molds showed no signs of fusion, corrosion, or cracks.

VIBRATION CUTS HOT CRACKS

Application of Vibration During Crystallization for the Elimination of Hot Shrinkage Cracks. I. I. Novikov, G. A. Korol'kov, A. E. Semenvo. *Liteinoe Proizvodstvo*, No. 1 January, 1958, p. 7-8.

The attempt to eliminate hot-shortness by using alloys with higher eutectic content is impractical since the caster is unable to increase the quantity of eutectics without affecting the mechanical and physicochemical properties of the casting. Also, in some cases eutectics are not present or present only in very small quantities which cannot be increased.

For healing the cracks in an alloy of given composition, vibration in the process of crystallization may be used. Results are presented of an investigation of the effect of vibration during crystallization on the hot-shortness alloys. Articles tested were rings of an aluminum alloy that contained practically no eutectics, possessed a considerable effective crystallization interval (about 130° C) and had a particularly large tendency to the formation of hot cracks.

It was found that the hot-shortness decreased practically linearly with increasing frequency of vibration. For different heights of the rings a minimum frequency was obtained that assured a casting with-

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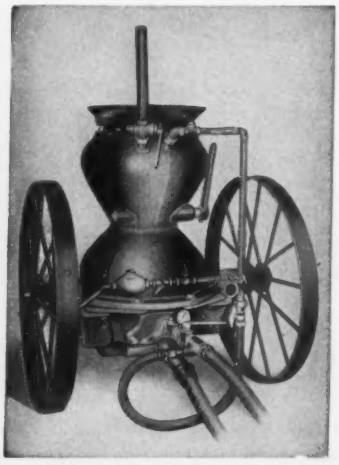

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out cracks. A disadvantage of chill vibration casting is the roughness (nodulation) of the surface of the casting. The vibration should therefore be restricted to castings that are to be machined or for whose surface no strict requirements are imposed.

The nodulation could be completely eliminated by starting the vibration after the hardening of a sufficiently strong crust of the casting, but it is not always possible to determine exactly the start of the vibration. The application of vibration not only eliminates hot cracks but assures a denser casting with a smaller grain.

OXYGEN AND CUPOLA MELTING

Iron Casting with Oxygen Blast Through Forehearth. A. P. Perov and L. G. Saksonov. *Liteinoe Proizvodstvo*, No. 1, January, 1958, p. 24.

The Electrostal cast iron foundry, having a cupola of 10 tons per hr capacity, installed apparatus for blowing oxygen through the forehearth with the aim of increasing metal temperature.

A continuous blast of oxygen or compressed air is applied through a copper tube nozzle which flows from a two-way stopcock pipe line. The pipe line is connected with oxygen and compressed air lines.

The mechanism, to clean the air of moisture and oil, consists of two parts—an oil-water separator for preliminary cleaning of the air and a silica gel filter for final air purification.

During the first hour of operation the cupola turns out 5-6 tons of iron per hour. The temperature in the ladle is raised from 1330 to 1410° C, consumption of silicon is from 7 to 8 per cent and expenditure of oxygen is 10 cu m per ton.

Application of above method has made possible, with little capital expenditure, to obtain liquid iron at temperatures of 1400° C (2552° F) and even higher.

MECHANIZED SHELL CASTING

Mechanization of Production Lines for Shell Casting. F. I. Simornov, M. M. Budylin. *Liteinoe Proizvodstvo*, No. 1, January, 1958, p. 3-5.

Casting in shell molds, besides assuring great accuracy and clean surface of the casting, makes possible the mechanization and automation of all the processes involved.

Article describes, with the aid of detailed sketches, apparatus devel-

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"A nine-week run was made on "T" shot and a ten-week run on ordinary chilled . . . Results: 14.4 lbs. per wheel-hour on "T" Shot, 28.0 lbs. on chilled."

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oped at the Kiev motorcycle factory for the mechanization of the shell casting process which solved the problems of moving sand to the preparation systems and the finished mixture to the machines, and the delivery of shells and cores to the place of assembly.

Metal is poured into the molds from a suspended conveyor and the gases formed in the process exhausted. On account of its simplicity and low cost, such a system can find wide application in plants where shell casting is employed.

Mechanization of sand preparation starts with the delivery of sand by a grab crane into a bin of 15 cu m capacity. The sand is moved from this bin by blades of a continuously operating measuring hopper and is placed into a three-way, gas-fired drying chamber with output of 1.8 tons per hr. From there it enters a suspended vibrating screen of 1 sq mm mesh and output of 3 tons per hr. Moving by screw conveyor, sand enters an elevator from whence it pours into an automatic apparatus for preparation of the mix. The mix is then moved by jaws of shut-off device to the machines for making molds and cores.

All conveying equipment is airtight to keep out dust. Dust and gas in the dryer is drawn off by a cyclone. The entire cycle of operation is controlled by an automatic electro-pneumatic mechanism.

Editor's Note: Readers interested in obtaining full translations of any of the foregoing articles, including illustrations, should write the Language Service Bureau, 859 Paxton Rd., Cleveland 8, Ohio.

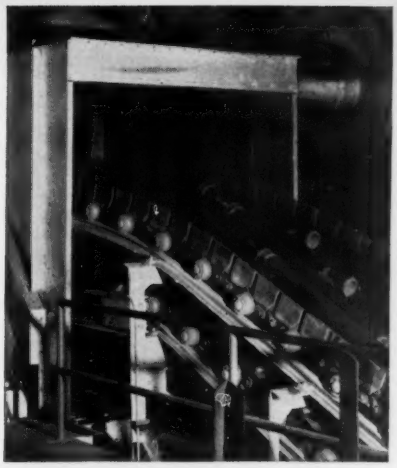
Book Review

***Rapid Analysis of Nonferrous Metals and Alloys*, by George Norwitz, cloth, 112 pages, 4½ x 7 in., published by Chemical Publishing Co. Inc., New York. Price $4.25.**

It is claimed that the procedures selected are based on accuracy, simplicity and reliability in the hands of routine operators. Increased reliance has been placed on sequence procedures and use of mathematical correction factors to eliminate lengthy separations. Colorometric procedures are stressed.

Book is divided into 16 chapters. The first six cover special reagents, ingot copper, brasses and bronzes, monel metal and nickel, aluminum alloys, and magnesium alloys. These are followed by chapters on zinc, zinc-base diecasting alloys, cadmium, tin, lead, and lead-base bearing alloys.

Machine-made fittings for cast iron soil pipe are made with a high degree of automation . . . via time-tested Jeffrey foundry equipment.



Jeffrey apron conveyors hustle new Charlotte-Spun® pipe from casting machine to cleaning and inspection facilities.

Charlotte Pipe meets challenge with

automatic pipe foundry

Jeffrey equipment has put soil pipe and fittings production on a fast track at Charlotte Pipe and Foundry Company's new multi-million dollar plant.

Production of cast iron soil pipe and fittings in this plant represents a major advance in foundry techniques. It involves a patented process using centrifugal force to distribute molten iron uniformly within metal molds lined with sand. Electronically-controlled machines produce smooth, seamless, easy-to-cut pipe.

Jeffrey-built sand conditioning equipment, belt conveyors, leakproof apron conveyors and bucket elevators are stepping up efficiency by mechanized movement of sand, pipe and fittings at this new North Carolina foundry.

Jeffrey engineering service will help make *your* foundry more productive, more profitable . . . with Jeffrey unit machines or a completely engineered foundry system. The Jeffrey Manufacturing Co., 907 North Fourth Street, Columbus 16, Ohio.

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Circle 623 on Page 119

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Until new things have become old enough for us to learn all about them, under all circumstances, we can't be entirely at ease with them"

Acres of Diamonds

ALL I wanted to do one day recently was to dash out to the Pontiac Foundry and borrow some limestone for a rush job in the Lee Hobby Foundry, but I didn't get back on schedule. I ran into too many friends. In fact, I didn't even try to get away. There were a lot of foundry subjects that needed proing and conning, and there is nothing I'd rather do than to talk over things when it comes to foundry operations.

Ted Schroeder, the boss, and several of his research boys were all steamed up over a new method of bonding cores. They cooped me up in an office to get my reaction on what they were up to. I warned them that they couldn't expect much from the old amateur, coming in cold on a development as involved as the one they had been sweating on for so long. But my warning didn't scare them off, for they went on with greater enthusiasm and in greater detail.

After reaching a point of mental indigestion, I said, "Hey, wait a minute. Suppose your fairy foundry godmother could wave a magic wand and solve all of the problems you're wrestling with, what would this revolutionary core magic do that your present, common, ordinary, conventional core method wouldn't do?"

All the fellows started to answer at once, with their hopes, hunches, proofs, ifs, ands, and buts intertwined with some very encouraging promise. They showed me some exciting samples.

Realizing that at this stage of the game neither they nor I could make any profound appraisal or observation, I couldn't help saying, "Well, there's one thing I'm sure of. Whether or not this new development turns out as you and I hope it will, this research activity you're carrying on is a darned good, wholesome thing for the morale of the whole outfit, provided of course that you don't go overboard expensewise. Too many foundries," I added, "either get into a rut or go hogwild on every new gimmick that makes the rounds."

At this point, the boss, who like most effective managers listens more than he talks, said, "Doc, I agree with you that continuous research is a must and that doing it within your means is another must; but I don't want you to think that we doodle around with every fad and cure-all that makes the rounds.

"In fact," he went on to say, "in spite of our belief in research, we might be considered by some to be slightly on the old-fashioned side. We have not taken up quite a few of the new glamour developments. And I'll tell you why—we have found that many of our standard procedures and time-proved, conventional methods provide even greater returns on research development than some of the highly publicized wonder workers.

A lot can be said for the old, conventional practices

"Now don't get me wrong. As this project the boys were telling you about indicates, we are wide awake for new developments which show promise of paying for themselves. But we are not going to let them blind us to a field of profitable opportunities lying around under our very noses in our tried and proved conventional foundry practices."

Moved by his unusual and unexpected oratory, I said "Hooray!"

After I got back to the Lee Hobby Foundry, much too late to fire the cupola, Ted's little speech went 'round and 'round in my head. Newness is always exciting, I muttered to myself—particularly in comparison with the older things we have lived with for so long that we take them for granted. We sure have had one grand parade of exciting innovations, and that's something which speaks well for the virility of this grand old craft.

They have included hot blast, dry blast, shell molds and cores, the CO_2 process, automation, vacuum melting, nodular iron, pearlitic malleable, rare earths, and a whole bag of metallurgical tricks. With time,

Photo courtesy American Car and Foundry Div., ACF Industries, Inc.

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Foundrymen like moly because it is reliable, easy to use and does not require changes in their base iron.

Get full details. Send for "Why Moly Iron," a series of practical bulletins that explain how moly makes better iron castings. Or ask our foundry representatives to call. Write: Climax Molybdenum Company, a Division of American Metal Climax, Inc., 500 Fifth Avenue, New York 36, N. Y.

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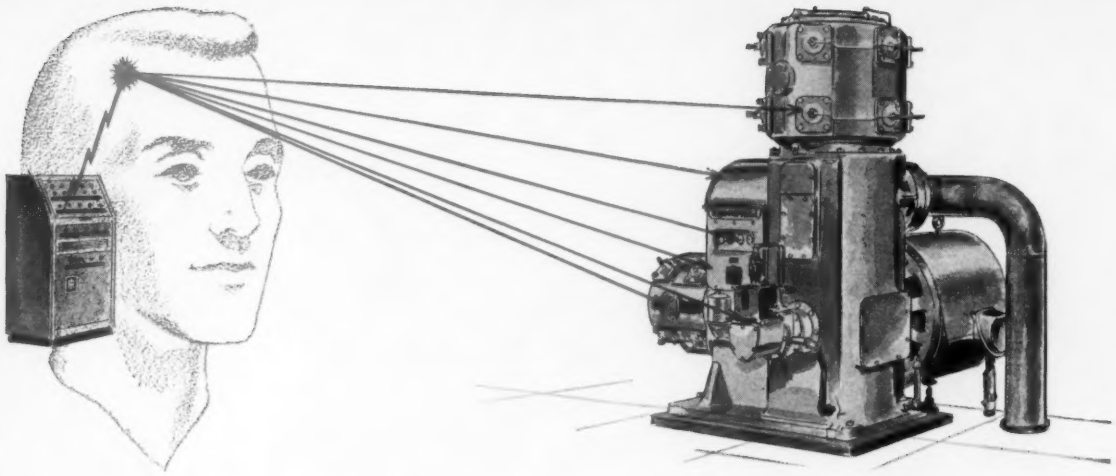
Circle 624 on Page 119



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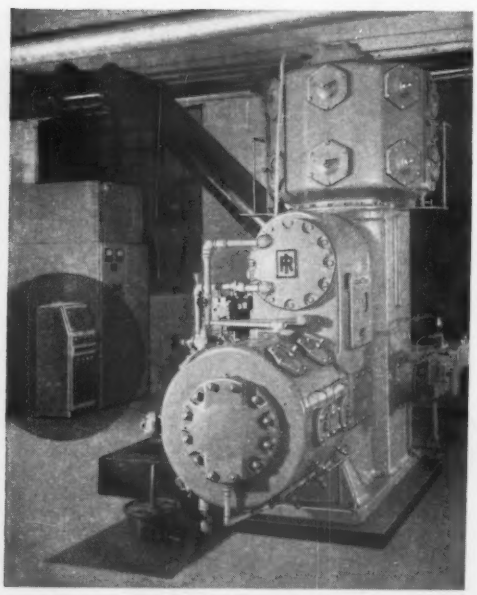

'Tendamatic control of this Ingersoll-Rand type XLE two-stage heavy-duty air compressor assures maximum protection of capital investment, maximum manpower utilization, continuity of production and lower maintenance expense.

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Any time there is a variation from normal operation, the 'Tendamatic identifies the nature of the malfunction and gives audible *and* visible warnings. If the warnings are ignored or forgotten, 'Tendamatic shuts down the compressor before any damage can result.

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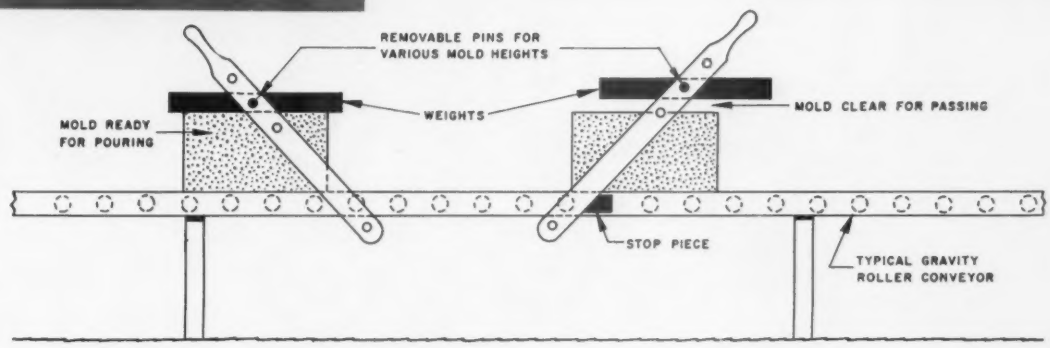


Weight-Setting Device Reduces Scrap, Eases Burden on Workers

By JAMES J. SILK
Taylor & Co.
Brooklyn, N. Y.

A DIFFICULT foundry job and one which often contributes to the number of defective castings produced is the placing of weights on molds prior to pouring. Improper placement of the weights sometimes results in mold drops. Furthermore, workers may sustain strained backs when they set and remove the weights.

The weight-setting device illustrated here may solve those problems in foundries where molds are poured on gravity roller conveyors. Side pieces on the device are made of ½ x 3-in. hot-rolled steel. The swivel pins are 1-in.-diam cold-rolled steel welded to the underside of the conveyor frame. Removable pins holding the mold weight also are 1 in. in diam. They fit into a hole in the weight and also into holes in the side pieces. The side pieces may have several holes to permit placing the weights in various positions to handle several mold heights.

Tops of the arms are tapered to accommodate a piece of 2-in.-diam pipe which serves as a handle for moving the weight assembly. Stop pieces welded on the sides of the conveyor frame restrict full travel of the side arms in one direction to hold weights above the molds and let them pass by before and after pouring.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

however, the old pendulum settles down from its wide swing of newness to the resistance of use and application and the cruel whip of that old meany economics. The so-whats get in their licks, and the yes-buts come into play.

We never will become immune to the sex appeal of novelty, fortunately. But until new things have become old enough for us to learn all about them under all sorts of circumstances, many of which could not be foretold, we never can be entirely comfortable with them. So it would seem that the novelty has to wear off the new things before we know what's what. As Ted said, there's one whale of a lot can be done with the old conventional practices, even though they lack glamor and sex appeal.

By the way, I've had one heck of a time with that darned cantankerous cupola: I can't get the iron hot. It used to work all right. I wonder what the devil has got into it. Looks as though a research project on old things is in order.

"For Pete's sake, is safety the only thing you can talk about?"

National Safety Congress Will Meet Oct. 20-24

National Safety Council will hold its 46th National Safety Congress Oct. 20-24 in Chicago. Congress headquarters will be in the Conrad Hilton Hotel, with sessions scheduled there and at the Congress, Morrison, and La Salle Hotels.

Included in the metals section discussions are: "Thermite-Reactions—Nonferrous Metals," W. R. Gilliland, Aluminum Co. of America, Pittsburgh; "Health Hazards in the Foundry," Lynn D. Wilson, Wilson Industrial Hygiene & Research Laboratories, Chicago; and "Fundamentals of Radiation," Howard H. Fawcett, Research Laboratory, General Electric Co., Schenectady, N. Y.

Plaques given first-place winners in the council's annual metals section safety contest will be presented.

Left, zirconium-thorium alloy for permanent mold casting is taken from gas-fired furnace in a small ladle to minimize melt agitation. *Right,* alloy is poured into a permanent mold

Permanent Mold Casting of ZIRCONIUM-THORIUM ALLOYS

By **FRANK GAINES**
President
Gaines Co.
Rivera, Calif.

THE first permanent mold castings made of zirconium-thorium alloys of magnesium have been produced by the Gaines Co., Rivera, Calif.

Such alloys are lightweight materials with excellent mechanical strength at elevated temperatures. Because of their thorium content, they theoretically are radioactive; but their radiation output ordinarily cannot be detected with a Geiger counter.

Cost Is High—Some forms of zirconium-thorium alloys have been used by manufacturers in both the United States and Europe for several years to make such things as powerplant components for aircraft and missiles. They still are limited to a few highly specialized applications, however, because of their cost. For permanent mold castings, the cost now ranges from about $25 to $50 a pound, simply because the basic materials are expensive.

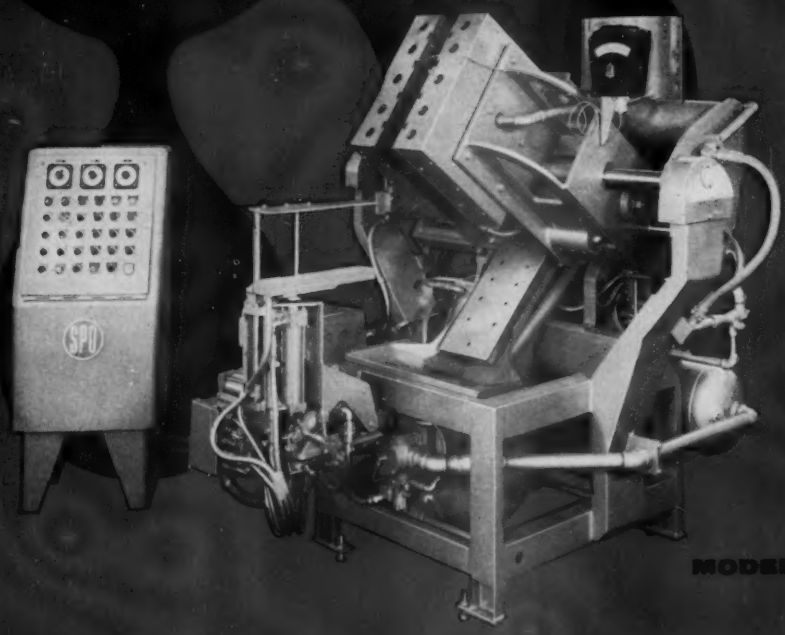
Prior to our recent accomplishment, Dow Chemical Co., Midland, Mich., ran a series of tests which indicated that zirconium-thorium alloys can be cast with some degree of success in sand molds. But authorities in general doubted whether consistently good results could be obtained on a true production basis.

Melting Is Problem—Main reason for the pessimism is the tendency of the alloys to separate when they are melted in open crucibles. This behavior not only results in substantial losses of zirconium, but also can cause flux inclusions in castings;

Zirconium-thorium alloy also is poured into sand molds. To insure production of sound castings, same general methods are employed as with permanent molds

SPO's ANGLE-BLO holo-core MACHINE

with fully automatic unloader



MODEL SC-30

SPO ANGLE-BLO DESIGN

SPO's new holo-core machine blows, cures, strips, unloads hollow cores or shell molds, recharges sand magazines . . . automatically and without operator attention!

Model SC-30 will mass produce a wide variety of hollow cores and shell molds quickly, economically . . . handles core boxes up to 16 x 21 x 9 inches . . . blows 30 lbs. of solid core . . . permits reduction of cycle time and temperature best suited to individual pieces. Before you buy any core blowing equipment, get all the facts on SPO's ANGLE-BLO design.

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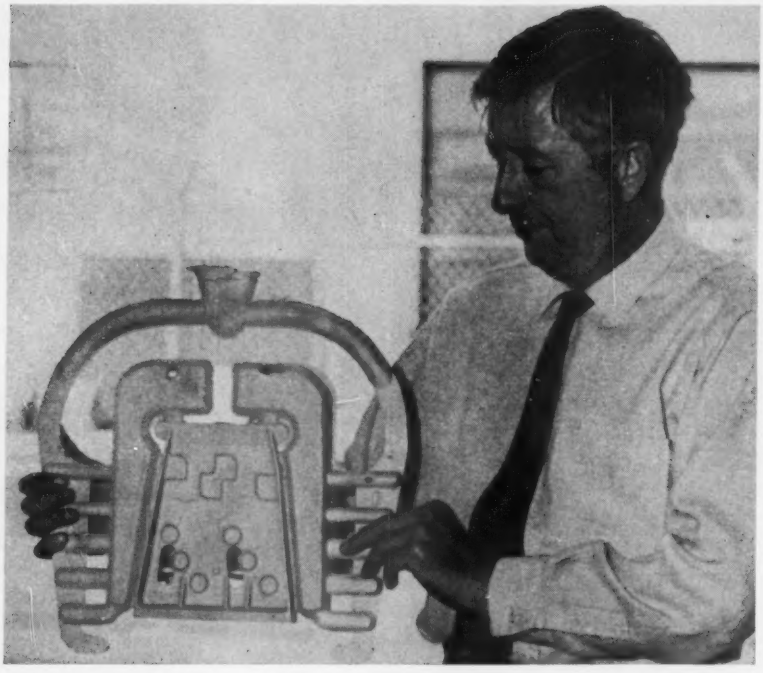
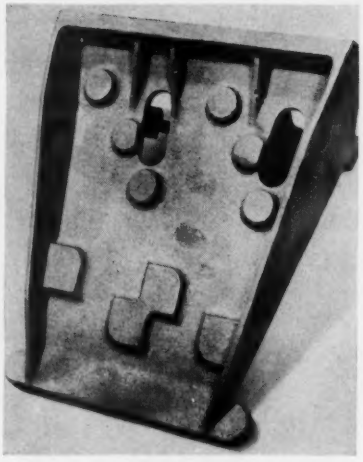
Write for Bulletin SC-30.



The author exhibits one of the more intricate permanent mold castings made by his foundry with a zirconium-thorium alloy of magnesium



Closeup of a zirconium-thorium casting made for Boeing

these other problems also are involved:

1. The possibility of cross contamination since the most minute quantities of some metals like aluminum can alter the composition of a zirconium-thorium melt so that subsequent castings will not respond to grain refining treatments.
2. The likelihood that a slight turbulence in the flow of metal during casting would lead to the production of defective castings.
3. The probable brittleness of as-cast metals.

Offsetting these and other disadvantages were advantages, aside from those already mentioned, which had created a demand for zirconium-thorium castings. For example, they are less susceptible to microshrinkage than other rare earth alloys of magnesium, and they possess extremely fine grain.

Uses New Crucibles—To minimize the possibility of cross contamination, we decided to use new steel crucibles in gas-fired furnaces to melt the zirconium-thorium alloys. In view of the high melting temperatures of zirconium and thorium, this use of steel crucibles may seem impractical; but actually, like other magnesium alloys, these alloys become molten at temperatures of 1400 to 1500° F.

During the melting process, the metal temperature is elevated as rapidly as possible to prevent the aforementioned segregation. A flux is used to promote fusion by reducing impurities to gases or slags, and the temperature of each melt is stabilized in the 1475° to 1500° F range for about 20 minutes.

This allows undissolved zirconium to settle and permits the separation of flux from the melt, after which a magnesium-zirconium hardener and mischmetal are added to the mix as necessary to obtain a specified composition. Purpose of the mischmetal is to replace rare-earth alloying elements lost during melting or remelting operations.

Careful temperature control is essential during the stabilization period because proper zirconium content cannot be maintained if the heat of the melt is too low to accomplish complete dissolving or is high enough to enable the element to pick up iron from the crucible.

In pouring molten zirconium-thorium alloys, our workers use the smallest possible ladles to avoid excessive agitation of melts.

Because the permanent molds have been designed to assure a smooth flow of materials, casting defects due to turbulence to date have been insignificant. Similarly, good handling procedures have been found sufficient to prevent breakage of solidified castings.

Although it differs markedly from procedures initially used by Dow to cast zirconium-thorium alloys, the general technique discussed here has proved suitable for the production of castings in sand, shell, and semipermanent molds as well as in permanent molds.

Typical laboratory analyses have shown that the thorium content of the new castings ranges from 2.8 to 3 per cent; zirconium content is from 0.72 to 0.66 per cent—all well within specification limits for Dow's HK31A alloy. Simultaneously, flux inclusions have been nil.

Differences in castings produced in various types of molds have generally been the sort of deviations that could be expected if the same work were done with other nonferrous metals. It therefore is not surprising to note that zirconium-thorium permanent mold castings have better physical properties, finer grain, more accurate dimensions, and superior finishes.

Book Review

***Proceedings* of the American Society for Testing Materials, Vol. 57 (1957), cloth 1430 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $12.**

Contains 52 technical papers and discussions and 66 reports of technical committees presented at the 1957 meeting of the society in Atlantic City, N. J. Also includes the president's annual address by R. A. Schatzel on "Our Expanding Technology and ASTM," the report of the board of directors of the society, and reports of several administrative committees.

Why LINK-BELT-mechanized sand handling consistently

increases production, improves working conditions

MOLDING STATION LINE is designed for high production. Individual overhead molders' hoppers eliminate floor storage of sand—promote a cleaner foundry.

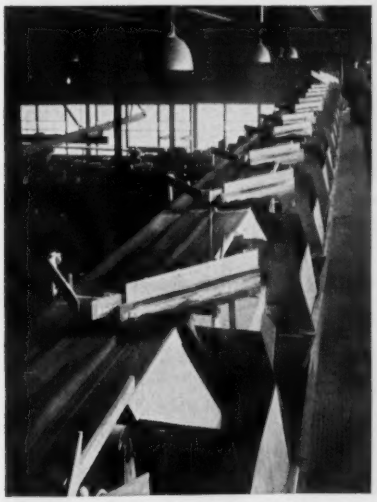
System at A. B. Chance non-ferrous foundry holds down unit costs, utilizes maximum use of manpower

LIKE other progressive foundries all over the country, A. B. Chance Co. of Centralia, Mo., has found Link-Belt sand handling mechanization the key to more profitable operations. By improving the quality of their prepared sand, this foundry reduced scrap and increased production. Also, working conditions were improved because the foundry was made cleaner and more orderly.

No two foundry mechanization problems are alike. That's why it will pay you to take advantage of Link-Belt's broad experience and equipment in laying out a system for handling sand and castings best suited to your requirements. Call your Link-Belt office today or write for Book 2423.

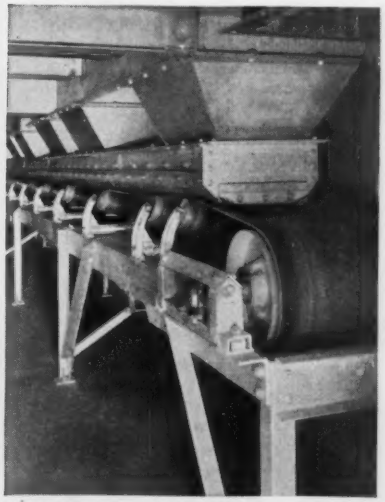
LINK-BELT

CONVEYORS AND PREPARATION EQUIPMENT



DISTRIBUTING BELT CONVEYOR delivers prepared sand to molding stations directly below. System is designed to handle approximately 40 tons per hour of prepared sand for production of brass and aluminum castings.

PADDLE MIXER combines water with shakeout sand from storage bin producing a uniform molding sand. Link-Belt makes single- and double-shaft mixers in a range of capacities.



TRANSFER BELT CONVEYOR under floor receives shakeout sand through grates and transfers it to bucket elevator. Conveyors can be equipped with magnetic devices to remove ferrous metal particles.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

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COMPRESSORS

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Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

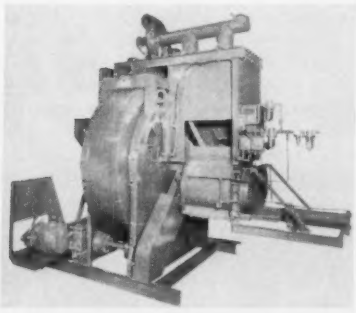
AIR AND GAS COMPRESSORS • VACUUM PUMPS • PNEUMATIC TOOLS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS

FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 169

SHELL SAND COATING UNIT

Manual Mixall is economy model for hot coating sand with resins used in shell molding process. It comes equipped with motor, exhaust system, full flame gas control, and thermocouples, with temperature in-



dicator for sand temperature control. Manual valves are used to perform the pneumatic operation. Resin, water, and hexa additons are made manually according to proper temperatures as recorded on the temperature indicating unit.

Batch capacity is 3 cu ft, and up to 2000 lb of sand per hour can be coated by the machine. A heater drum heats 300 lb of sand up to 350° F within 3 minutes, and the twin-shaft pugmill can coat up to 300 lb within 3 to 5 minutes, depending on resin levels and types of sand. The basic manual model can be adapted to fully automatic operations by adding the control panel with full automation at any future date.—**C & S Products Co.**, 18656 Fitzpatrick Ave., Detroit 28, Mich.

For More Details Circle No. 401—Page 169

TEST BAR MEASUREMENT

Micro-Scale can be used for quick measurement of per cent of elongation in foundry test bars. Readings reportedly are fast and accurate. Scale adjustments can be made in increments of 0.001 in. Other typical applications include its use in mold layout, die work, comparator templates, and similar applications.

Tool is constructed with satin-chromed steel parts, and scale markings are white on black. Units are available with 6, 12, 18, and 24-in. scales.—**Trico Machine Products Corp.**, 2664 Grand Ave., Cleveland 4, Ohio.

For More Details Circle No. 402—Page 169

STEEL BELT CONVEYOR

Flat-Top hinged steel belt conveyor is for flush-with-floor or conventional above - floor mounting. Each belt link is precision formed and overlaps and interlocks to provide a virtually smooth surface. The conveyor is made from heavy-gage steel with interchangeable components.

Operating in a single, predeter-

mined direction, in flush-to-floor installations the conveyor offers a "moving sidewalk" for heavy loads while permitting crossing truck and personnel traffic with the belt in motion. The surface is sealed to prevent parts and tools from falling through and to provide maximum safety. Used in floor-mounted conveyors, it allows the side deflection of parts with irregular surfaces, sharp edges, and corner flanges without jamming or damage to parts or to the belt.

This belting can be furnished in any width or length in abrasion-resistant high-carbon steel or in stainless steel to resist corrosion.—**May-Fran Engineering Inc.**, 1692 Clarkstone Rd., Cleveland 12, Ohio.

For More Details Circle No. 403—Page 169

MEASURING MICROSCOPE

Micro-Mike is a 20-power, pocket-sized inspection and measuring microscope with a superimposed scale.

A four-lens optical system in a lightweight metal casing is said to provide a flat, undistorted field. The superimposed scale, with 0.002-in. graduations, is internal and cannot be scratched or smeared. No adjustments are needed.

The instrument permits easy, accurate inspection and measurement of small parts and of fine lines, screens, meshes, etc., where micrometers cannot be used. It also is available without the scale. — **DuMaurier Co.**, Elmira, N. Y.

For More Details Circle No. 404—Page 169

IMPREGNATION COMPOUND

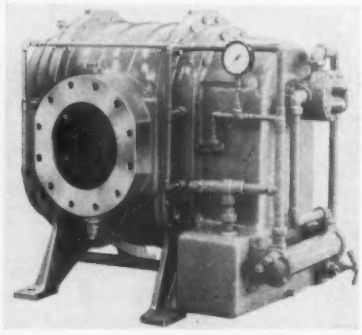
Porlox Hy-Pen is a new impregnation compound said to reduce casting rejections to 1/10 of one per cent. Controlled and balanced

oxidizing agents and materials with better wetting qualities are claimed to achieve penetration of small pores formerly untouched. Deep penetration eliminates extrusion of material during service. The impregnant can be used in many existing impregnation systems and in all of the company's high-vacuum type equipment.—**Prenco Products Inc.**, 507 E. Ten Mile Rd., Hazel Park, Mich.

For More Details Circle No. 405—Page 169

BLOWERS

Blower employing the rotary positive principle is said to introduce major design and operating advantages. It features vertical ar-



rangement of impellers, providing horizontal inlet and discharge connections for convenient piping. The drive shaft extends from the lower impeller to match motor shaft heights. Segmented waist impeller shape permits safe handling of entrained liquids and also affords more quiet operation.

Flanged stub shaft design permits a higher pressure rating for a given impeller length so that greater displacement can be delivered without extremely high rotating speeds. This design is said to reduce over-all dimensions to a minimum. External bearings and separate oil reservoir are eliminated. Delivery of completely oilfree air or gas is assured by double seals on the shafts.

Thirty-six sizes are offered in capacity ranges from 2000 to 14,000 cfm at 6 psig and from 1500 to 8000 cfm at 10 psig.—**Roots-Connersville Blower**, 900 Mount St., Connersville, Ind.

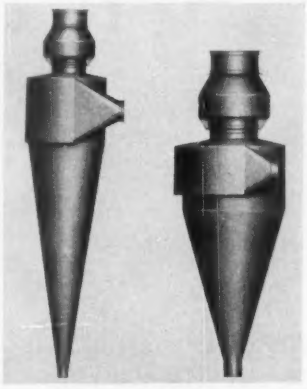
For More Details Circle No. 406—Page 169

CENTRIFUGAL COLLECTORS

Series C centrifugal collectors include two design types in a total of 41 sizes. They are said to offer highly efficient air cleaning and dust collection, using centrifugal force, with minimum cost and maintenance.

The Design 3 collector is intended for applications in which dust size runs above 44 microns, but may contain small percentages down to 20 microns. At standard air density and normal rating, these collectors operate at 2-in. water column S.P. Capacities from 350 to 54,500 cfm are available.

Design 5 collectors, equipped with a relatively small-diameter, long cone, are high centrifugal force units designed primarily for dust



sizes below 44 microns. Normally rated at 4-in. water column S.P. at standard air density, they can be used for high efficiency down to 20 microns on all sizes. Only small-diameter units can be used in the range from 5 to 10 microns. Capacities from 260 to 6500 cfm are available.—**Kirk & Blum Mfg. Co.**, 3100 Forrer St., Cincinnati 9, Ohio.

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ALUMINUM PIG ALLOYS

Two new pig alloys have been added to the line of aluminum master alloys and hardeners produced by the company. Developed to help sand and permanent mold foundries reduce costs, alloys 2351 and 2370 can be made into alloys 355 and 356, respectively, by the addition of magnesium during melting operations in the foundry. If desired, small amounts of grain refiners can be added at the same time. Use of these master alloys can save 2½ to 3½ cents a pound for companies casting alloys 355 and 356, it is claimed. — **Reynolds Metals Co.**, Richmond 18, Va.

For More Details Circle No. 408—Page 169

JIB CRANE

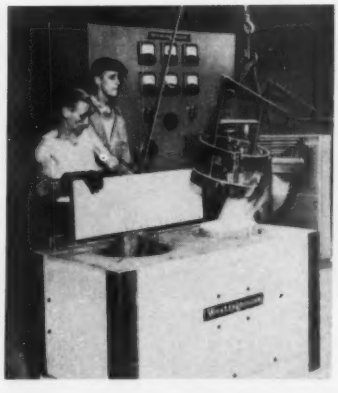
Jib Master is a self-supported jib crane which can be rotated through 360 degrees. It is constructed with a heavy steel floorplate, heavy-walled seamless tubular column, and six wide flanges. These elements are welded together to form a rigid frame.

Thick side plates are accurately positioned and welded for perfect alignment of the boom. A precision-tapered roller thrust bearing and two side rollers provide free boom rotation. Side rollers are machined

Induction Melting Furnaces Made in Two Types

Push-out and tilting-type induction melting furnaces for high melting speeds and accurate metallurgical control are available in capacities from 50 to 5000 lb. For nonferrous alloys, when alloy contamination cannot be tolerated, the push-out furnace (shown here) offers quickly interchangeable crucibles. These furnaces are available as single or dual units. The tilting-type furnace is recommended for steel and other ferrous alloys and also can be used for nonferrous melting.

Both furnaces produce uniform analyses with 30 to 1250-kw motor-generator sets. High melting speed at frequencies from 960 to 10,000 cps minimizes metal loss, and nothing is present to contaminate the molten pool. Features of both types include sturdy construction, water-cooled



leads, compact control station, and heavy-duty, water-cooled selector switches. — **Westinghouse Electric Corp.**, Industrial Electronics Dept., P. O. Box 416, Baltimore 3, Md.

For More Details Circle No. 431—Page 169

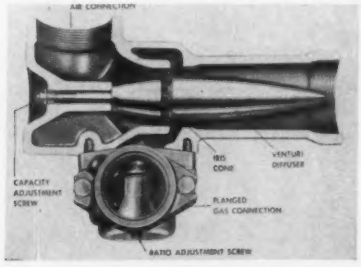
carefully to furnish a wide bearing surface for transmittal of forces and to reduce wear. Rollers are situated at a point where stresses between stationary and revolving members of the crane are balanced and the bending moment of the column is at a minimum. Designed for use with either a chain block or an electrical hoist, these cranes are available in capacities to 6 tons and with boom lengths to 20 ft.—**Borg-Warner Industrial Cranes,** 1536 South Paulina, Chicago 8, Ill.

For More Details Circle No. 409—Page 169

PROPORTIONING MIXER

Adjusta-Flow air-gas proportioning mixers for gas burners are said to offer superior adjustability of capacity without need for changing mixer parts for making such adjustments. Calculating and changing of jets, venturi, sleeves, or rods are eliminated without sacrificing accuracy of air-gas mixing.

The inverted iris cone is expanded or reduced in diameter with an external capacity adjustment screw for setting the desired maximum flow rate. Accurate proportioning of gas and air is accomplished with a gas governor. The mixture then is made richer or leaner over the entire range by the ratio adjustment screw on the mixer. Single valve



control for the entire range is provided by a manual or motor-operated air control valve.—**Hauck Mfg. Co.,** 124-36 Tenth St., Brooklyn 15, N. Y.

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INDUCTION HEATERS

Line of induction heating units is available in three ranges: Low frequency, 7½-1750 kw, 1-10 kc, motor generator powered; medium frequency, 3-50 kw, 450 kc, electronic generator equipped, and high frequency, ¾-20 kw, 27.1 mc, electronic generator equipped. The equipment is said to offer precision heat control for a wide range of heat treating applications. Installations can be furnished with automated parts handling and feeding systems, engineered to individual job requirements.—**Robotron Corp.,** 21300 W. Eight Mile Rd., Detroit 19, Mich.

For More Details Circle No. 411—Page 169

BARREL FINISHING MACHINE

Economy series barrel finishing machine has 30-in. diam by 32-in. long barrel for high-volume finishing of small parts and also provides fast action on large castings. Total barrel capacity of 13.8 cu ft or 1000 lb can be divided into two compartments if desired. Variable speed control permits adjustment of barrel rotation speed from 10 to 30 rpm. A positive magnetic brake and forwarding and reversing switch permit easy positioning of the barrel for loading and unloading.

Barrels are available either un-

lined or with ¼ or ½-in. Neoprene lining. The barrel itself is heavy-gage steel. Other features include a rollaway perforated hood, a cam-operated door, and self-aligning bearings with Zerk fittings and expanding dirt-seal rings. — **Almco, Queen Products Inc.,** Albert Lea, Minn.

For More Details Circle No. 412—Page 169

DETACHABLE CONTAINERS

Company has developed a system of material handling which employs detachable containers with capaci-

ties up to and more than 40 cu yd. It offers completely hydraulic operation without winches, sheaves, telescopic cylinders, cables, or chains. All pickup and handling operations are performed without the driver's leaving the truck. Containers can be moved on or off docks.

Components are a tilting frame, two hydraulic raising and lowering cylinders, and a double-acting bail cylinder which pulls containers up the tilting frame with a ratcheting action against recessed hooks spaced at intervals under the container.

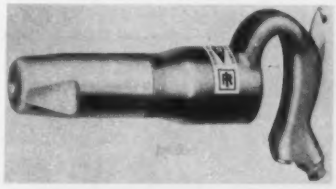
Two models are available for over-the-road use, one handling 22,000 lb and the other 30,000 lb. Maximum height and length of container is limited only by state regu-

Chipping Hammer Has Power-Controlled Cut

Chipping hammer with a rubber-bonded "shock absorber" nozzle and a controlled power valve permits tailoring power of the hammer to requirements of a given job. The tool is said to absorb chisel vibration, provide comfort and efficiency for the operator, reduce the noise level, and eliminate breakage of parts caused by improper operation.

A valve makes possible four adjustments of the power of the hammer—to light, normal, extra, and super cuts. Five hammer models are available, making a total of 20 graduations from which to select the most appropriate tool.

Conversion of a hammer of any of the five sizes to any one of the four power ratings is accomplished by changing the valve box cap. These caps are designed so that each provides a different length of valve travel. A feature of the hammers is the plating of certain parts with a long-wearing chrome plate. Other con-



struction features also are incorporated in the hammers to give them smooth, full power under all operating conditions. — **Ingersoll-Rand Co.,** 11 Broadway, New York 4, N. Y.

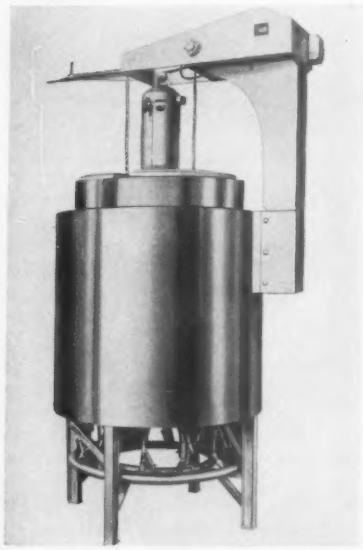
For More Details Circle No. 432—Page 169

lations. Off-the-road models under development will be available with hoisting capacities limited only by load capacity of the truck.—**Dempster Brothers,** Dept. DS-66, Knoxville, Tenn.

For More Details Circle No. 413—Page 169

HEAT TREAT FURNACE

Gas-fired, carburizing - nitriding furnace designed for precision control of atmosphere and temperature also may be used for general heat



treating work at temperatures to 1850° F. Design features provide accurate raising, lowering, and alignment of furnace cover; well-engineered construction for long furnace life and low heat loss; good atmosphere circulation, and efficient heating. Furnace also is available as an electrically-heated unit in a number of standard sizes and capacities. For a balanced system, an automatic endothermic generator may be used as a line in converting commercial gas to heat and process atmospheres, and an ammonia dissociator can be used to provide a nitriding atmosphere.—**Pacific Scientific Co.,** 6280 Chalet Drive, Bell Gardens, Calif.

For More Details Circle No. 414—Page 169

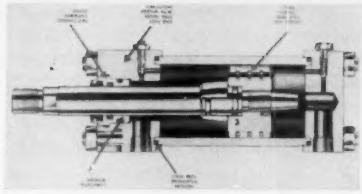
DUST COLLECTOR

Line of cyclone, separator-type dust collectors now is equipped with radial fans which are said to have a high air movement rating and to operate efficiently against static pressure. The collectors are recommended for use where large volumes of dust or other air contaminants must be collected. Dust reservoirs have pull-out drawers for easy emptying. Clean air normally is discharged outside. Models also are available with cloth after-filter bags or disposable glass wool pads when heated or conditioned air is to be recirculated.—**Torit Mfg. Co.,** 287 Walnut St., St. Paul, Minn.

For More Details Circle No. 415—Page 169

HYDRAULIC CYLINDERS

New hydraulic cylinder line features a pressure-tightening tube seal. This "O" ring seal is on the outside diameter of the tube, fully confined between the tube and cylinder head.



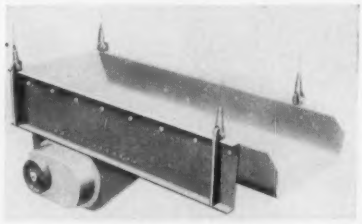
Minute expansion of the tube under pressure squeezes the "O" ring and increases tightness of the seal.

These cylinders are rated at 2000 to 3000 psi nonshock and have a generous safety margin. Bore sizes range from 1½ through 8 in. Thirteen basic models and a choice of rod sizes offer a standard cylinder for most applications. All have industry standard mounting dimensions and conform to JIC recommendations. They also feature double seal cast iron piston rings and a fast-change cartridge gland with automatically lubricated bearing.—**Hanna Engineering Works,** 1765 Elston Ave., Chicago 22, Ill.

For More Details Circle No. 416—Page 169

VIBRATING FEEDER

Vibrating feeder capable of absorbing great impacts can be mounted directly under a hopper or bin to feed, convey, pick, or scalp high tonnages of bulk materials, including lumps up to 36 in. in diam. Speed of the vibrator can be



changed by adjustment of the variable-speed belt drive; the hopper gate can be adjusted to control material depth; and the horizontal stroke can be adjusted to control material trajectory.

Available in a wide range of dimensions, the feeder can be floor supported or suspended by cables from bins, tanks, or hoppers. It also can be equipped with a number of special features such as dust-tight covers, scalping decks, and a short grizzly section.—**Link-Belt Co.,** Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 417—Page 169

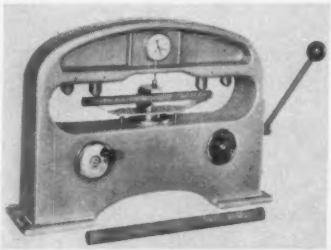
MIXING PROPELLER

Claw mixing propellers smoothly mix products that have a tendency to remain lumpy. Powders

Transverse Tester Provides Test Bar Data

Transverse tester is reported to provide accurate technical data on physical properties of gray iron four minutes after a test bar has cooled to handling temperature. Machining is not required on transverse bars, nor is any special training required to operate the machine.

A leaf-spring bar holder locates test bars and prevents a broken bar from leaving the machine. Rapid closing and slow application of load are provided by a two-speed hydraulic pump. Pressure gage reads directly in pounds, and a free-traveling red pointer magnetically follows the load applied and holds at the maximum reading until released by the operator. Bar defection



is measured by a micrometer dial gage with the shaft shielded against damage from breakage of the test bar. The machine is self-contained and requires no utility service. — **Pasadena Hydraulics Inc.,** 1433 Lidcombe, El Monte, Calif.

For More Details Circle No. 433—Page 169

PROOF: B&W Refractories withstand CO and H_2 prepared atmospheres

ATMOSPHERE	APPLICATION	CONSTRUCTION	RESULTS
60% CO	Pusher Type Malleabilizing Furnace	Walls lined with B&W K-23 Insulating Firebrick backed with B&W K-20 IFB. Roof construction—9′-0″ wide sprung arch of B&W K-23 IFB.	No major rebuilding in 21 years.
40% CO	Radiant Tube Annealing Furnaces Malleable Iron Company	Bases lined with 7″ Kaocrete-A, backed with 6″ Kaolite-20. Base size—21′-9¾″ x 9′-9¼″. Temperature 1550 to 1600 F.	In service 11 years. Reducing atmosphere has no effect on the base. All portable annealing furnace bases in plant lined with B&W castables. *Maintenance costs reduced greatly.*
		Bell type covers lined with 9″ B&W K-23 IFB standard shapes in the arch, side and end walls. 13½″ K-23, with Kaowool, is used around the radiant tube openings. Cover is 22′-6″ x 10′-5½″ outside x 8′-4½″ to top of arch.	After approximately 6 years of service, lining showed no disintegration from reducing atmosphere.
65% CO	Radiant Tube Annealing Furnace	Base lined with 5½″ Kaocrete-A and 3½″ Kaolite-20 on top of 5½″ of block insulation. Base size 21′-9″ x 9′-9″. Temperature 1700 F.	Formerly heavy firebrick linings required rebuilding yearly. B&W castable construction has given more than 9 years' service. Customer standardized on B&W castables.
100% N_2 and 100% H_2	Elevator Type Annealing Furnaces Large Steel Co.	Walls lined with 9″ B&W K-23 IFB plus 3″ K-20 IFB. Furnace size 6′-0″ x 16′-0″ x 4′-0″. Temperatures in excess of 2100 F.	B&W refractories show no sign of deterioration in six furnaces of this type in 3 years' operation. Barring mechanical damage, refractories should give long additional service.
100% H_2	Rectangular Hood Type Annealing Furnaces	60 Furnaces, 24 have wall construction consisting of 18″ B&W K-26 IFB plus 2½″ K-1620 IFB. 36 units use wall of 9″ B&W K-26 IFB plus 5″ K-1620 IFB. Furnace size—12′-0″ x 8′-6″. Temperature 2150 F.	Of the 60 covers in service only 2 were rebuilt after 2 years' service. Plant masonry superintendent reports no shrinkage; estimates 15 years' additional life if not for mechanical abuse.

Consult your B&W Refractories Representative for helpful information on your prepared atmosphere problem.

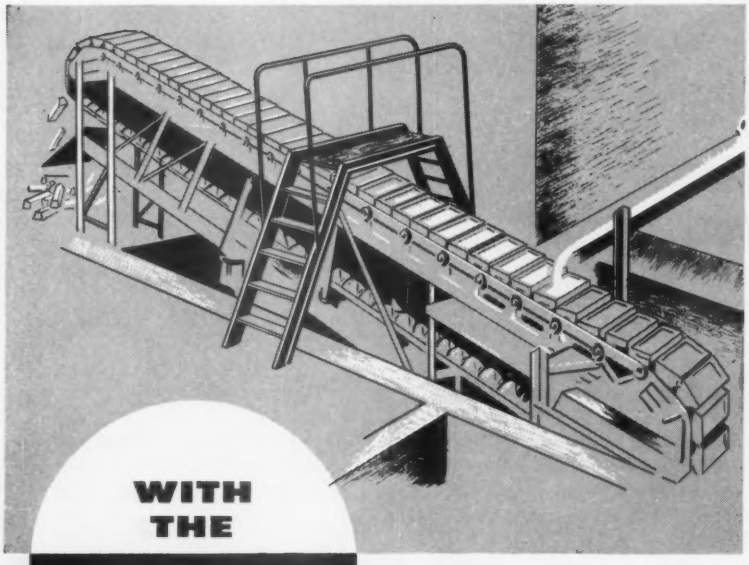
B&W REFRACTORIES PRODUCTS: B&W Alimul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide • B&W Ramming Mixes • B&W Kaowool

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

Circle 629 on Page 119

Simplify
Pig Casting
Operations . . .



WITH
THE

Bailey
PIG CASTING
MACHINE

The unique "stationary wheel" design greatly increases service life and pig casting economy for foundries and small metal producing plants. With this design the roller bearing idler wheels are mounted on the frame rather than on the moulds— thus keeping them far as possible away from hot metal.

- 80% of moving parts eliminated by stationary wheel design
- Capacities from 3 to 50 tons per hour
- Lengths: 15 to 125 feet, in multiples of 5 feet

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

and other soluble solids are said to go into finished solution quickly. The propellers are formed from polished stainless steel plate and are available in stock diameters of 3, 4, 5, 6, 7, 8, 10, and 12 in. Other sizes can be made to order. Pro-

peller hubs are machined to existing shaft diameters and fitted with headless stainless set screws.—**Craddock Equipment Co.**, 1507 A St., Wilmington, Del.

For More Details Circle No. 418—Page 169

VERTICAL PNEUMATIC SANDER

Model 500-V vertical pneumatic sander is designed particularly for easy feather-edge sanding and fine

metal finishing. Its light weight and long handles are said to permit quick manipulation and high accuracy. The pneumatic motor is quiet and free from vibration. Starting, stopping, and throttle adjustments are thumb-controlled. Rugged construction features include precision-ground working parts and a strong aluminum housing. The unit can be obtained with motors operating at 2300, 3000, or 4000 rpm. It weighs 4⅝ lb and can be used with either a 5 or a 7-in. sanding disc.—**Airetool Mfg. Co.**, Springfield, Ohio.

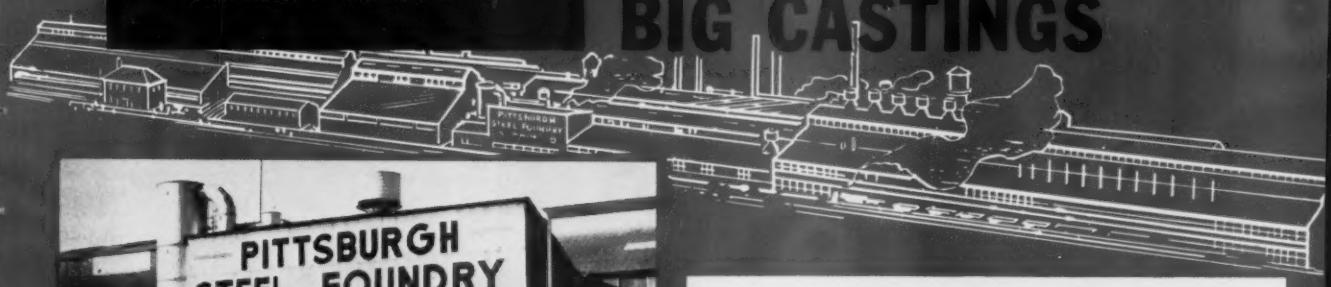
For More Details Circle No. 419—Page 169

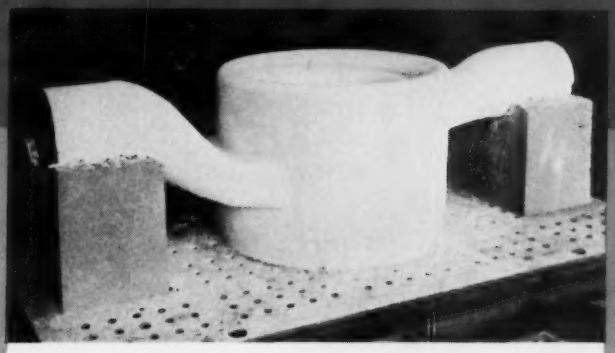
TROLLEY LUBRICATORS

Automatic trolley lubricators for conveyors have been completely redesigned. A built-in air cushion allows a bent trolley to pass without

For PITTSBURGH STEEL FOUNDRY

KOLD-SET CUTS COSTS ON BIG CASTINGS

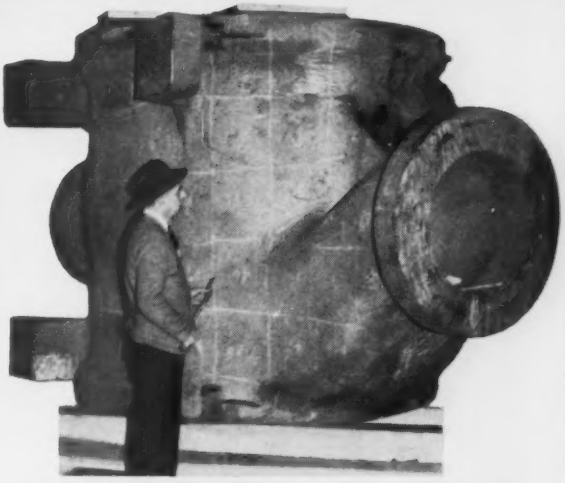




CORE-MAKING TIME REDUCED FROM 78 TO 10 MAN HOURS ON 90,000 POUND CASTINGS

A further savings: No rough cleaning required—compared to 40 hours with conventional sand cores.

Measuring 4′ high and 15′ wide, the above core is used in making a gas transmission line booster casting. The completed steel casting has metal sections 8″ to 10″ and free of metal penetration. Cores are made with 6 tons of Kold-Set sand and are double-coated before baking with Zircon Wash.



142,000 lb. High-Pressure Booster Castings—100% MAGNAFLUXED, COMPLETELY X-RAYED

A further savings: No rough cleaning required—compared to 60 hours with conventional sand cores.

The above 8′ by 14′ booster casting has an 88″ diameter discharge opening with metal sections from 5″ to 17″. 20 tons of Kold-Set sand are used in making the cores. Among the other advantages are less metal penetration and cleaner casting surfaces.

GET THE FACTS ON KOLD-SET!
Write or phone for Technical Bulletins.

Circle 631 on Page 119

KOLD-SET®

THE ORIGINAL COLD-SETTING BINDER

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Kold-Set is Patented in the United States

BE MODERN WITH THE BEST
CONTROLLED ABRASIVE
CONTROLLED PERMABRASIVE
EXPENDABLE PALLET PACK
Forty 50 lb. cartons in one master pack: easy to store, easy to inventory, easy and safe to handle. No Extra Cost. (Also in conventional 100 lb. or 50 lb. bags.)
We invite your inquiries
Contact any HICKMAN-WILLIAMS office
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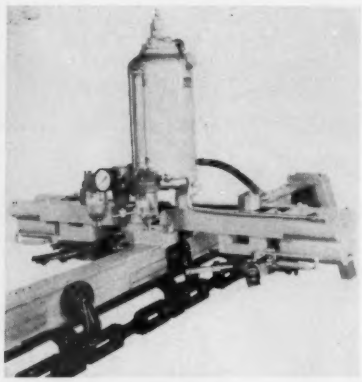
(INCORPORATED)
CHICAGO · DETROIT · CINCINNATI · ST. LOUIS · NEW YORK
CLEVELAND · PHILADELPHIA · PITTSBURGH · INDIANAPOLIS
Established 1890

breaking the nozzle. Amount of grease or oil injected into each trolley wheel bearing is adjustable and fully automatic. Conveyor trolleys



may be yards apart or as close as 6 in. Only power sources required are an airline and the moving conveyor. Eight models are available, including power and free and other lubricators for either oil or grease, chain lubricators, and models for roller chains and other chain drives. —**Olsen Mfg. Co.**, 638 S. Rochester Rd., Clawson, Mich.

For More Details Circle No. 420—Page 169

PLATFORM CONVEYOR

Moto Flow freight conveyor is designed to move loads up to 1 ton and is adaptable to many conditions of use between building levels. It can be installed between floors, into basements, or over existing stair-

ways. Simple pushbutton controls at each floor level eliminate the need for trained operators.

Safety features include an automatic, mechanical platform safety brake which locks the platform instantly if either or both cables become slack. The motor also cuts out and locks. An automatic "slack-cable" switch operates instantly to stop the motor if any obstacle is encountered during descent of the platform. A solenoid brake between

Allis-Chalmers Trucks with TRI-LIFT Masts

STACK NEARLY ½ HIGHER

YET WORK IN LOW HEADROOM

Allis-Chalmers 4,000-lb fork truck with Tri-Lift mast enters a low-headroom truck at the loading dock.

Here the same truck reaches high for efficient yard stacking, with its Tri-Lift 144-in. mast.

STORES MORE MATERIAL — Wherever there's room above for stacking, an Allis-Chalmers Tri-Lift truck gives you up to 50 percent extra storage space at your "fork tips." No penalty when you work around low overhead obstructions, either.

OPERATES IN ENCLOSED TRAILERS AND BOXCARS — In addition to reaching up nearly one-half higher, an Allis-Chalmers Tri-Lift mast, when lowered, ducks through low doorways or into enclosed trailers and boxcars.

IT'S SIMPLE, WITH GOOD VISIBILITY — Uses only a single, standard lift cylinder — like any conventional mast. No complicated ratchets or latches. This simplicity means more visibility through the mast.

FIND OUT MORE — Call your Allis-Chalmers material handling dealer. He'll be glad to demonstrate the advantages of Tri-Lift mast. He'll help you select the "years-ahead" model and capacity truck that will best suit your particular needs. You may have detailed literature by writing direct. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

BH-76

Circle 633 on Page 119

the winch and the motor automatically stops the conveyor at any point desired or when power fails. —M-B Corp., New Holstein, Wis.

For More Details Circle No. 421—Page 169

GRINDER-POLISHER

Model ND-12 No-Dust grinder with U-2 abrasive belt attachment offers a versatile grinder-polisher combination. Abrasive belt attachment is available for right or left-hand mounting and handles belts from 72 to 90 in. long and 1 to 2½ in. wide. Other attachments, including a table, permit it to do platen and contour grinding.

Rubber contact wheel 12 in. in

diam gives surface speed on the belt of 5500 sfpm. Dust hoods at the wheels collect grit and dirt and filter clean air back into the room through a built-in dust collector which requires no extra floor space. —Hammond Machinery Builders Inc., 1605 Douglas Ave., Kalamazoo, Mich.

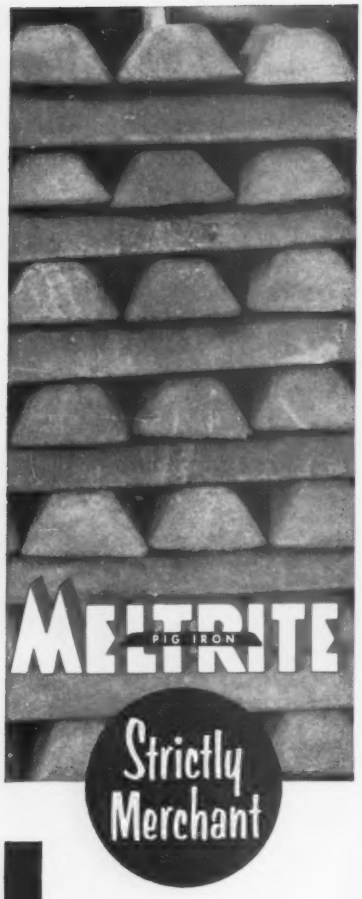
For More Details Circle No. 422—Page 169

DUST FILTER BAGS

Three-section bags now are standard equipment in the company's Dynaclone dust filters. They are claimed to give triple life, reduce filter erection time, and provide for easier inspection.

The filter bag is divided into three equal-sized pockets by two lengthwise seams. Two rubber-coated inner spacers are inserted in each section. Elimination of outer spacers between bags avoids abrasion and simplifies construction. A protective flap at the dust-chamber end of the bag provides extra reinforcement at that point.

Bags are made of cotton sateen cloth with 104 x 68 thread count per square inch. Each bag has a



Meltrite is strictly a merchant pig iron. The entire production is *for sale* at all times.

Always in dependable supply.

SERVICE DEPARTMENT AVAILABLE WITHOUT OBLIGATION

Serving Industry Since 1883

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PICKANDS MATHER & CO.
CLEVELAND 14, OHIO
Chicago • Cincinnati • Detroit • Duluth
Erie • Greensboro • St. Louis • Washington

IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

Circle 634 on Page 119

MILWAUKEE SOLVAY

Highest Quality Foundry Coke

SINCE 1904

MILWAUKEE COKE SOLVAY

Year after year MILWAUKEE SOLVAY COKE ranks as a superior foundry coke...made from *carefully selected* coal:

1. Low in ash
2. Low in sulphur
3. High in carbon
4. Highly resistant to shatter and abrasion

SERVICE DEPARTMENT AVAILABLE WITHOUT OBLIGATION

Serving Industry Since 1883

P M

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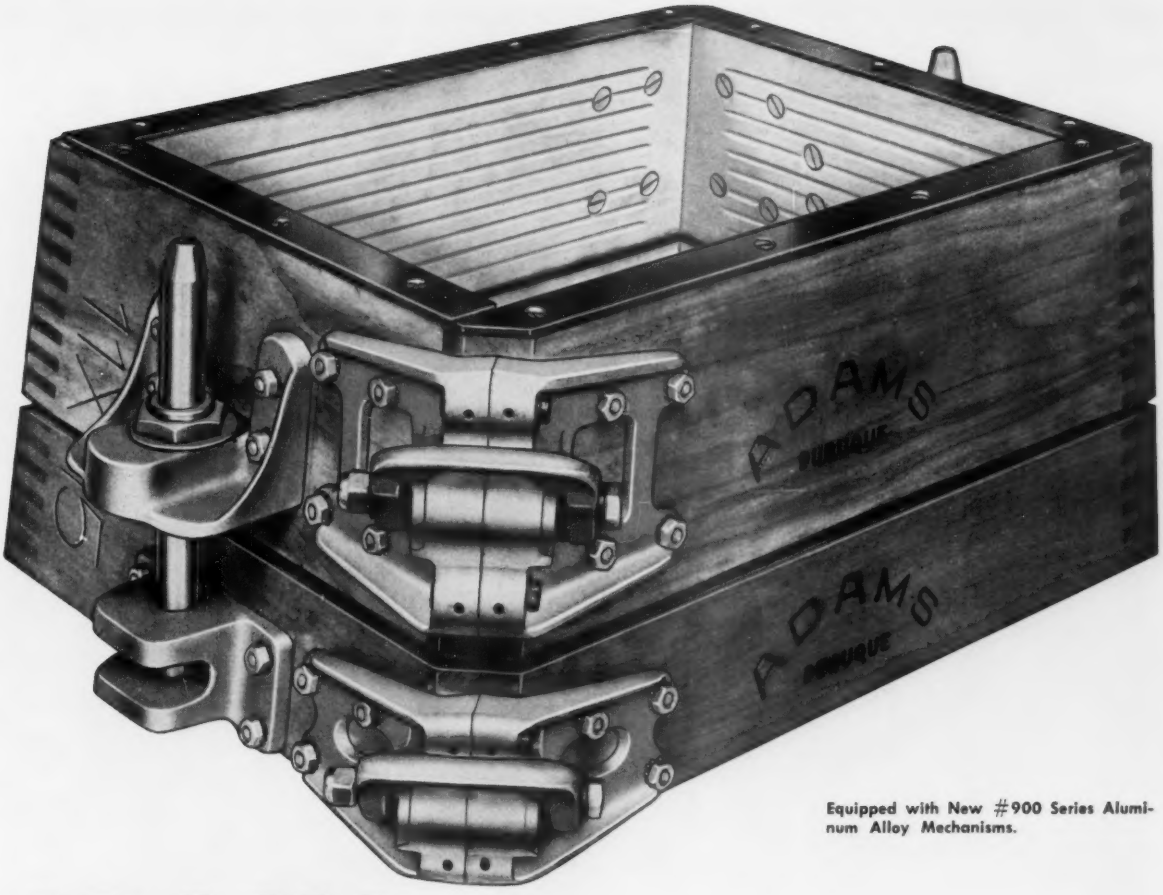
IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

Circle 635 on Page 119



Equipped with New #900 Series Aluminum Alloy Mechanisms.

ADAMS CHERRY EASY-OFF FLASK

MAKE REAL SAVINGS FROM THESE ADVANTAGES!

CHERRY EASY-OFF FLASKS are of proven design and construction.

CHERRY LUMBER is the finest available, carefully selected and thoroughly air dried.

SIDES AND ENDS finished 1½" on all standard size flasks. 1¼" and heavier on flasks of larger perimeters and greater depths.

SOLID CORNERS are machine dovetailed and maintained in rigidness through dipping in "Hot Glue" and machine locking.

ALUMINUM ALLOY TRIMMINGS are also used on Adams Aluminum Easy-Off Flasks when specified.

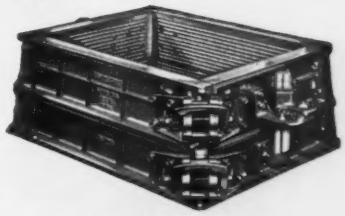
OPERATING MECHANISMS are identical with those used on the Adams Aluminum Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

STEEL PROTECTING STRIPS are standard equipment at top, bottom and parting. Aluminum strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified, Tee Iron Trusses if required.

PIN AND EAR ARRANGEMENT available to interchange with present pattern plate guides.

A COMPLETE LINE. Adams flask equipment meets your requirements in practically all methods of production. Before you invest, get the Adams story first. Write today for our big profit-making catalog.



Adams Aluminum Easy-Off Flask

Adams Jackets, Cast Iron or Aluminum

The ADAMS Company

Dubuque, Iowa

1883 75 years of progress 1958

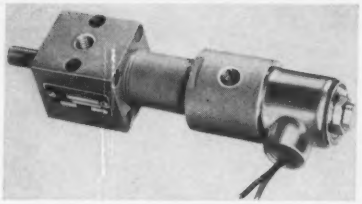
Circle 636 on Page 119

net effective area of 22 sq ft. Existing Dynaclone installations can be converted to the three-section bags. —W. W. Sly Mfg. Co., Cleveland 1, Ohio.

For More Details Circle No. 423—Page 169

VALVE-OPERATED CYLINDERS

Line of valve-operated cylinders combines a conventional single-acting cylinder with a three-way solenoid valve to provide an integral power unit. The one air connection can be made with flexible hose. Integral construction is said to assure instant piston response to the valve. Optional flow controls can be supplied in the front cylinder port and the solenoid valve exhaust port for positive control of piston rod speed in either or both directions.



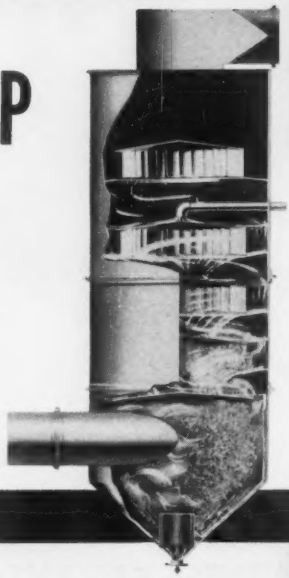
Manufacturer states that these units can be put into service in minutes and connected easily into the electrical sequence circuit. Foot, limit, or hand switches may be used. Bore sizes are 1, 1⅛, 1½, 2, 2½, and 3 in., available in any stroke length from 1/16 in. up. Pressure range is 0 to 200 psi. Most ac and dc voltages are available.—**Airmatic Valve Inc.**, 7313 Associate Ave., Cleveland 9, Ohio.

For More Details Circle No. 424—Page 169

SERVING FOUNDRYMEN THE WORLD OVER

CLEAN-UP TEAM found at most FOUNDRIES

MULTI-WASH COLLECTOR



"SW" CUPOLA COLLECTOR

This combination of Schneible Collectors is keeping foundries all over the country dust-free and fume-free for better public and employee relations, while completing schedules smoothly, too.

The effectiveness of Schneible air pollution control is a result of constant development to meet the need of today's and tomorrow's modern foundries.

Whatever your requirements, Schneible equipment is engineered to perform at top efficiency with low maintenance.

Write or wire for details for better foundry operation with Schneible dust controls.

CLAUDE B. SCHNEIBLE COMPANY

P.O. Box 296 Roosevelt Pk. Annex

Detroit 32, Michigan • TAshmoo 5-7772

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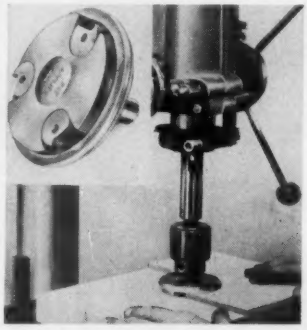
SCHNEIBLE

Refer to Sweet's File No. 1e/5c

WOODCUTTING UNIT

Tool called the Safe-T-Planer is said to permit speedy, accurate wood surfacing. Three high-speed steel cutters are used in such a way that there is no possibility of grab or kick-back, thus eliminating danger of injury to the operator.

Unit can be used in any drill



press with a ½-in. capacity chuck to surface wide or narrow boards to uniform thickness without hand tools. It is designed to operate at 5000 rpm. — **Kindt-Collins Co.**, 12653 Elmwood Ave., Cleveland 11, Ohio.

For More Details Circle No. 425—Page 169

AXIAL FLOW FANS

Line of Series 300 motorized axial flow fans is for direct mounting in ducts and stacks for exhaust or supply air applications. These Tubeaxial fans are in seven sizes from 18 to 42 in. ID and are available in ratings to handle from 2410 to 36,700 cfm.

They are equipped with inlet and outlet flanges for direct mounting. In addition, they are designed for simple application of corrosion-resistant coatings or construction with special metals to handle corrosive or explosive atmospheres. Separate fans and motor platforms are eliminated on the standard motorized units, and the anchored shaft design permits universal mounting in both

At Grinnell, molten iron is poured from air furnaces 16 hours a day (above) to produce over 2,000 different types and sizes of castings like those shown at right.

Grinnell uses HANNA SILVERY at their Columbia, Pa., plant to help maintain close silicon control

Grinnell Corporation is nationally known for its automatic sprinkler systems—a line relied on for dependable fire protection by thousands of American businesses. For these systems, and for its piping supply sales throughout the country, Grinnell at its Columbia, Pa., plant annually produces over 100 million malleable iron castings of uniform quality and dependability—pipe fittings, pipe hangers and supports from ⅛" I.D. elbows to 6" I.D. tees.

Every one of more than 2,000 patterns, many of them intricate, is cast from the same mixture. An all-important part of this mixture is Hanna Silvery Pig Iron. Grinnell metallurgists have found that Hanna Silvery, with its dependable analysis, gives them the silicon control so essential to the uniform qualities required in sprinkler systems and pipe fittings.

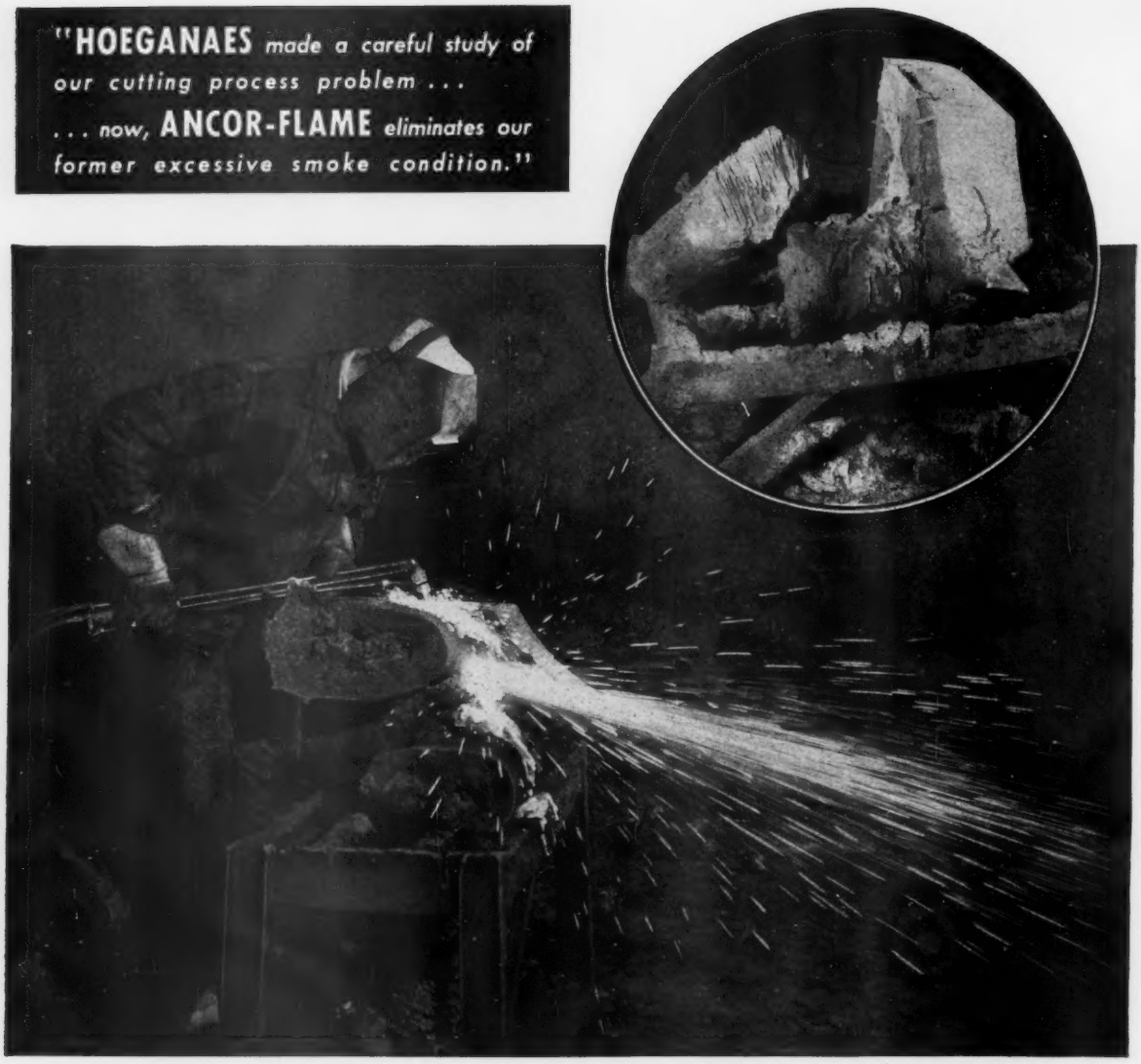
In addition to Silvery, Hanna produces all regular grades of pig iron, including HannaTite, a specially controlled close-grain iron. All are available in the popular 38-pound pig and the smaller HannaTen ingot.

Ask your Hanna representative how he can help solve your pig iron problems. He is an expert and as close as your telephone.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 638 on Page 119

"HOEGANAES *made a careful study of our cutting process problem . . .*
. . . now, **ANCOR-FLAME** *eliminates our former excessive smoke condition."*



In addition, Jack Trantin, Jr., President of Waunakee Alloy Casting Corporation, Waunakee, Wisconsin, lists many other user benefits.

Waunakee's major cutting operation is the removal of gates and raisers from high alloy steel castings. Eliminating excessive smoke was an important production improvement.

That was only the beginning. Mr. Trantin, Jr., gives Ancor-Flame additional credit. He puts it this way, "In adapting Hoeganaes Ancor-Flame we also benefited by faster cuts • uniform flow, no clogging • rapid recovery • less equipment adjustment • lower maintenance costs • lower unit costs.

"In view of these production advantages, as well as the productive services of the Hoeganaes Engineering Specialist, Hoeganaes Ancor-Flame is our standard specification for iron powder. Similar flame cutting equipment is being installed at our Youngstown Alloy Casting Corp. plant. Here too, Ancor-Flame will be "standard" for the flame-cutting operation."

Hoeganaes Ancor-Flame Iron Powder introduced into the oxygen stream, oxidizes rapidly—increases flame temperature. Easily permits flame-cuts of stainless steels and oxidation-resistant metals. Your Hoeganaes Engineering Specialist has more facts . . . *all the facts* . . . ask for them today.

HSIC

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

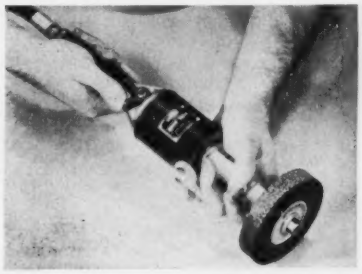
SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

horizontal and vertical stacks or ducts. — **Sturtevant Div., Westinghouse Electric Corp.**, Dept. T-187, 200 Readville St., Hyde Park, Boston 36, Mass.

For More Details Circle No. 426—Page 169

PNEUMATIC DIE GRINDER

Model 500 pneumatic die grinder is an extra-heavy-duty unit for grinding and finishing work, deburring, contour grinding, and working around any irregular shape.



With a collet attachment, it can be equipped with cone wheels or rotary files for fine finishing.

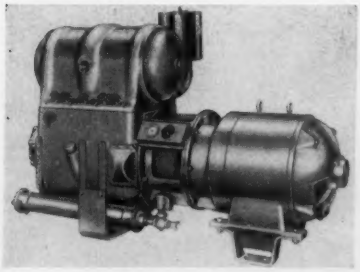
Features include a thumb throttle control lever which permits operator to control on-off switching with his thumb. The air-driven motor operates at 17,000 rpm at a recommended working air pressure of 90 to 100 psi. It weighs 3 lb and has a 3-in. wheel capacity. Over-all length is 14½ in. Collet capacity is either ¼ or ⅜ in.—**Airetool Mfg. Co.**, Springfield, Ohio.

For More Details Circle No. 427—Page 169

ROTARY COMPRESSOR

Heavy-duty, 100-hp rotary compressor is designed for continuous operation at 100 psi and delivers 420 cfm at that pressure. It also is suitable for intermittent use at pressures to 125 psi.

Unit occupies 15 sq ft of floor



space, can be anchored easily to any plant floor, and requires no special foundations. Discharge air temperature is 180° F. Automatic safety switch and time meter are standard equipment. Compressors are completely enclosed. Air-cooled or wa-

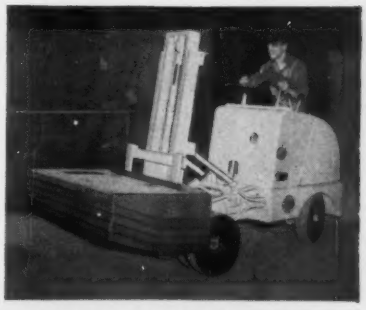
NEW! Multiple-tool R-18 Moto-Bug®

capacity: 3000 lbs.

Here is a new concept in material-handling methods that obsoletes expensive, single-purpose equipment. Kwik-Mix® Moto-Bug lets you haul, lift, stack, load, unload with *one* low-cost basic unit and easily-changed attachments. For example, check the new R-18 Moto-Bug, introduced here. As an 18-cu. ft. power wheelbarrow, or 42x54-in. flatbed truck, it hauls 3000 lbs., climbs 25% ramps fully loaded. As a tractor, it has 780 lbs. drawbar pull for towing wagons, carts — and 5-foot scraper blade for light clean-up, snow removal, etc. As a 7-foot fork lift, it handles 1500 lbs. at 15-in. load center.

This big-capacity, 4-wheel R-18 is maneuverable, light — travels at speeds up to 12 m.p.h. forward and reverse. There's direct drive to automatic power-flow transmission — *no clutching, no shifting.* It's powered by a 9.2 h.p. air-cooled gas engine — exhaust fume-control unit, or L.P. gas equipment optional. See Kwik-Mix distributor for a demonstration, or write us *today.*

Change R-18 Moto-Bug from hopper body to platform, and you have a heavy-duty 1½-ton truck. Towing hitch or 5-foot blade converts it to a light all-purpose tractor.



7-foot fork lift is easily attached to the R-18 Moto-Bug. Forks are adjustable 6 to 32 in. wide. Power tilts the mast 2° forward, 10° back for load pick-up, release.

Mail today

KWIK-MIX COMPANY PORT WASHINGTON, WIS. *Division of Koehring Co.*

Send us literature on R-18 Moto-Bug with: ☐ hopper ☐ platform ☐ fork lift

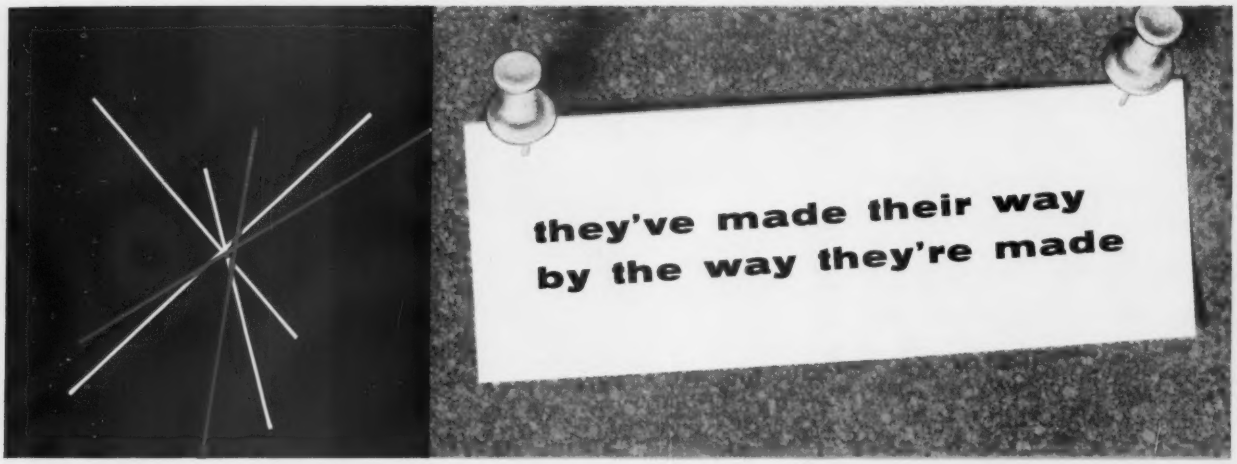
NAME_____ TITLE_____

COMPANY_____ DIV._____

STREET_____ KM8058F

CITY_____ STATE_____

☐ *Also interested in smaller 5-10 Moto-Bug with multiple attachments.*



Another Herman principle, inherent in this theme, is our approach to the problem of Design Engineering.

It's easy to explain . . . we *design with the customer in mind.*

In our development engineering of the Herman Moldmaster, for example, we ran tests for months, looking for the best way to ram a mold. Our design engineers decided the simultaneous jolt squeeze principle was best for the potential customer.

Our standard jolt rollover and draw machine is another example. This machine was designed to give 180° rollover with only 90° motion of the rollover arms and turnover plate. Rocking was eliminated and a better draw resulted, due to our air-on-oil hydraulic design.

Ability to stand heavy operating punishment is a big factor in foundries. Herman designed its jolt machine with striking discs set in a position to eliminate wear. The same customer benefit is shown in the placement of our corner wear plates.

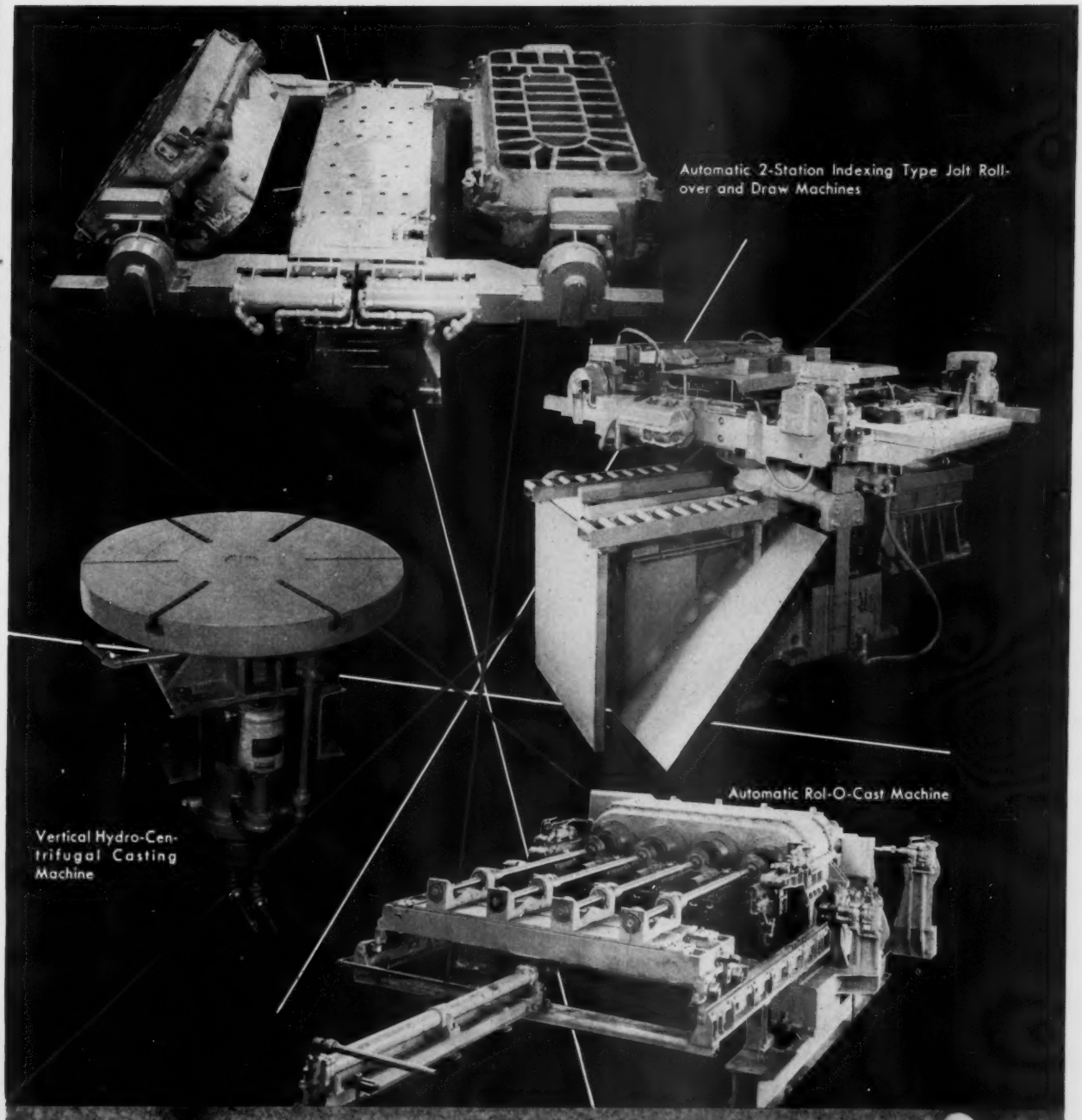
Again in terms of Design Engineering, Herman was first in the design of an indexing type machine utilizing automatic jolt, squeeze, strip operations . . . the Stationmaster.

A completely automatic *4-Station* Indexing Machine in Australia . . . anti friction bearings . . . new, large type stripping machines . . . push-button controls . . . the revolutionary Rol-O-Cast machine . . . the Herman Hydro-Centrifugal machine.

These are just a few examples of how Herman's original Design Engineering has helped Herman machines Make Their Way By The Way They're Made—providing its customers the world over with less machine maintenance, more production, economy, and faster amortization.

What do *you* have in mind?

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.


Automatic 2-Station Indexing Type Jolt Roll-over and Draw Machines
Automatic Rol-O-Cast Machine
Vertical Hydro-Centrifugal Casting Machine

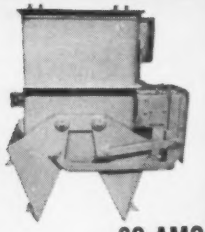
HERMAN

Best Known Name in Molding Machines

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

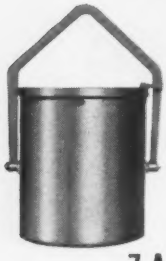
Circle 641 on Page 119

PENN IRON Buckets and Hoppers...a type and design to meet your needs exactly

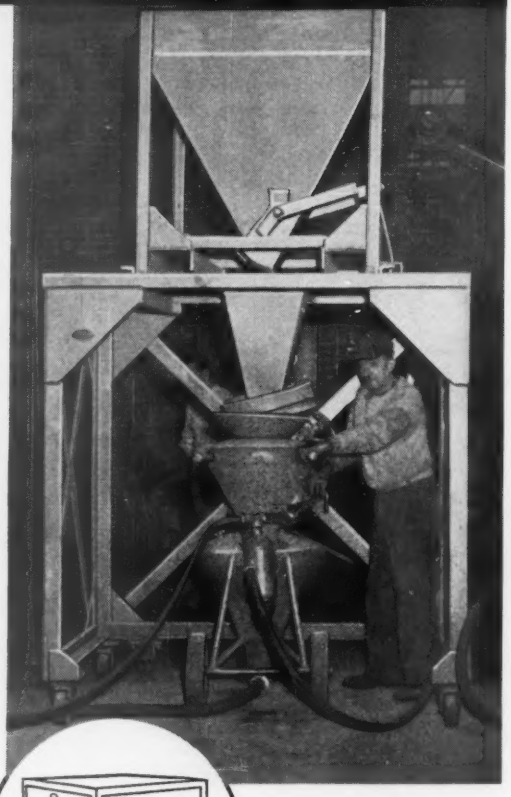


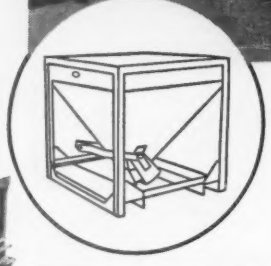
30-AMO

1-A

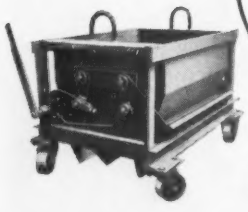


7-A

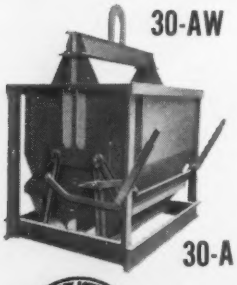




A special P-I designed hopper bucket makes cupola lining more efficient.



30-AW



30-A

WHERE bulk materials handling operations are costing you money and slowing production, Penn Iron Engineers can solve your problem economically, efficiently.

FOR many years Penn Iron has been designing special buckets and equipment for foundries everywhere. This wide experience and knowledge is available to you, to bring you maximum efficiency and lower cost handling.

SEE what Penn Iron special equipment can do to up your production. Write today, describing your problem, or ask to see a P-I representative.

MEMBER FEMA

PENN IRON WORKS, INC.

READING, PENNSYLVANIA

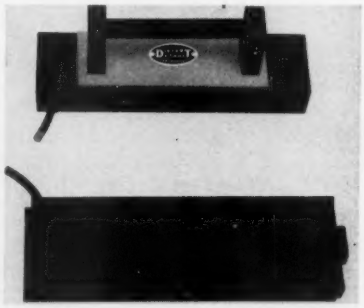
ter-cooled oil cooler models are available.—**Davey Compressor Co.**, Kent, Ohio.

For More Details Circle No. 428—Page 169

SHELL MOLD ACCESSORY

Heated shell mold curing accessory for curing tensile and transverse test specimens consists of two electrically heated steel blocks, each containing two heavy-duty heating elements and a thermostat.

The upper block is equipped with an insulated handle for convenient handling. A surface thermometer permits accurate settings of curing



temperatures to 550° F. A neon glow-lamp mounted in the end of each block indicates whether power is on or off. In operation, a standard specimen mold is placed on the lower block, filled with material, and leveled off, and the upper block is placed on top of it. A Transite pallet is furnished as the base for the accessory.—**Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 429—Page 169

EPOXY RESIN MODIFIER

Mod-Epox is a modifier for liquid epoxy resin systems which is said to offer improved end properties and substantial savings in formulating costs. It reportedly imparts a low initial viscosity, accelerates the rate of cure, and maintains or improves physical and electrical properties of finished resins while cutting their cost by 20 per cent or more. Dimensional stability, chemical and water resistance, and hardness are stated to be good.

Low initial viscosity of formulations made with the modifier permit use of larger amounts of fillers without a deteriorating effect on finished resins. The compound is liquid at room temperature and has a low order of toxicity. **Organic Chemical Div., Monsanto Chemical Co.**, St. Louis 24, Mo.

For More Details Circle No. 430—Page 169

NOW...YOU GET SMOOTHER... STRONGER SHELL CORES

(ANY TYPE SAND)

WITH

AMAZING...NEW DELTA SHELLKOAT FM WASH

Note how Delta ShellKoat FM Wash anchors itself to the surface by penetrating from 6 to 10 grains deep. This eliminates the possibility of sand errosion or burn-in and insures smooth casting surfaces.

NOTE THESE ADDED ADVANTAGES:

- ✓ PLASTIC TYPE WASH — mix with water to necessary Baume.
- ✓ Coating is uniformly bonded and equally as smooth after hot or cold dipping (70°F to 450°F).
- ✓ Highly Refractory
- ✓ No Runs
- ✓ No Buildups
- ✓ Washed surface is inert to molten metal.
- ✓ May also be used, with equal advantages, in coating conventional oil-sand cores.

...and IT'S ECONOMICAL TO USE!

DELTA

Ask for a Sample...

Working samples and additional information on Delta ShellKoat FM Wash will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CORP.
MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Circle 643 on Page 119

NEW!
IMPROVES SAND MOLDS and CORES!
ECONOMICAL HIGH-PURITY
WILNER BIRCHWOOD FLOUR

- Compensates for Sand Expansion . . . Keeps Finishes Smoother
- Provides Reducing Atmosphere . . . Keeps Finishes Cleaner
- Aids Sand Flow Around Patterns . . . Keeps Details Sharper
- Improves Collapsibility . . . Speeds Up Shakeout
- Helps Bonding Action . . . Improves Green Strength
- Increases Porosity . . . Protects Against Blowholes

Here's a super-refined hardwood flour ideally suited to the high purity requirements of shell mold mixes, green sand molds, and core sand mixes. Consistently pure, uniform in mesh size and water content from batch to batch, it combines top quality with outstanding economy. Find out how WILNER BIRCHWOOD FLOUR will improve *your* castings and cut molding costs. Send coupon for specifications and free testing sample.

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NORWAY, MAINE

Please send specifications and sample of Wilner Birchwood Flour.

NAME .....
TITLE .....
COMPANY .....
STREET .....
CITY..... ZONE..... STATE.....

Circle 644 on Page 119

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macauley Foundry Co.
Berkeley, Calif.

"The Saugus Story"

TO PEOPLE interested in early Americana, the restoration of Saugus Iron Works, at Saugus, Mass., will provide material for endless speculation. Since Saugus was the first large-scale producer of ferrous metal on this continent, it was largely responsible for the forging and casting industries which followed.

Although most of the reports thus far received have been of a fragmentary nature, and much of the story is lost beyond recall, at least one diligent historian has devoted five years of patient research to the subject. This work has resulted in a thought-provoking book, *Ironworks on the Saugus* (University of Oklahoma Press). Its author is E. N. Hartley, an associate professor at MIT. Although his study probably will provoke more questions than it will answer, it undoubtedly will be considered a substantial contribution to historical research about that period.

Saugus does not enjoy the distinction of having been the first iron works on the North American continent, or even in the area since known as the United States, but it unquestionably was the first to produce castings and wrought iron successfully in commercial quantities for the struggling colonies.

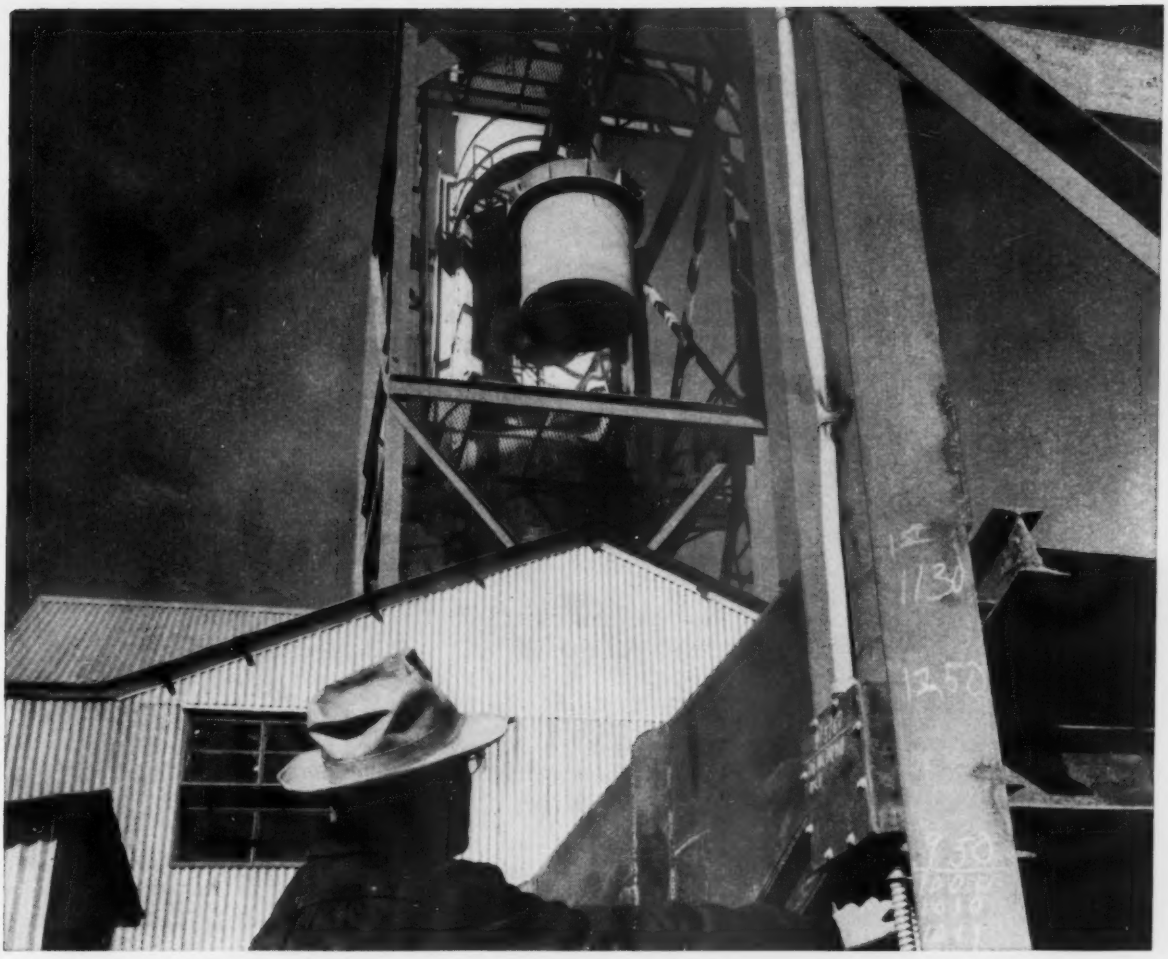
Mr. Hartley's story covers problems of the original Saugus promoters, led by John Winthrop the younger, who induced a group of English capitalists to launch what was to be known as the "Company of Undertakers of the Ironworks of New England." He clearly shows the attitude of both church and state toward an enterprise which could confer immeasurable benefits or destroy a measured way of life. There must have been a terrifying conflict in Puritan breasts as the people watched forests being reduced to charcoal and satanic flames darting heavenward from the belching furnace.

Privileged Class—The ironworkers from England drank and swore and were in frequent conflict with the law. They had little respect for Puritanical standards, but because they could produce much needed castings and bar iron, their unseemly behavior met with a toleration not granted to other members of the community. Sweeping concessions were granted to this infant industry in the form of long years of tax exemption; generous water, ore, and timber rights; immunity from military service for its workers; and other inducements, all intended to insure the success of ironmaking in the new world.

Hartley describes in considerable detail the making of charcoal, removing and processing of bog iron ore, type and operation of the smelting furnaces, and some of the many problems involved. But he dwells only briefly on the finished or salable products of Saugus. The words "molder" and "molding sand" are not mentioned. Although he occasionally refers to castings such as pots, skillets, firebacks, and weights, his research apparently revealed no foundry or foundryman.

He speaks of "clay molds," but gives no indication whatever as to the nature or source of this clay, nor of its precise foundry application. One page of illustrations shows a foundry floor, some primitive equipment, and six workmen presumably engaged in making loam cores for iron pots. Nothing else in the book is related to foundry technique.

After several years of precarious operation, Saugus Iron Works went bankrupt. Subsequently, Massachusetts and English court calendars were jammed with litigation



Four-man foundry does BIG job

The Rhude Media Co. of Marble, Minn., makes a fine iron powder for mines practicing beneficiation (reclaiming low-grade iron ore). Until recently, Rhude bought the needed iron in ingots. Now a new foundry enables the company to melt its own iron from scrap, using a Whiting #7 Cupola, U-Ladle, and Trambeam Charging System with two buckets.

The two-bucket cycle permits uninterrupted charging, assures the steady, high output needed to satisfy customers. Thanks to efficient Whiting equipment, only four men are needed in the melting department to keep the foundry operating at full blast . . . on a profitable basis.

Learn how you can save

by using modern, high-efficiency Whiting Foundry equipment. Write today for the booklet, FY 177 "Useful Information for Foundrymen." Whiting Corporation, 15607 Lathrop Avenue, Harvey, Illinois.

Member of the Foundry Equipment Manufacturers Association.

87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS

WHITING FOUNDRY EQUIPMENT

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD, AND CHEMICAL PROCESSING EQUIPMENT

NON-FLUID OIL

TRADE MARK REGISTERED

Best for Shake-Out Bearings

F-#925 and S-#58-M grades of NON-FLUID OIL have been specifically designed for shake-out lubrication. They have super-adhesive properties and stay in bearings, protecting against friction long after ordinary greases have been "knocked out". F-#925 and S-#58-M grades of NON-FLUID OIL outlast ordinary greases three to five times.

Leading shake-out manufacturers recommend initial and continued use of NON-FLUID OIL. Don't take our word for this—we will be happy to supply their names upon request.

Test NON-FLUID OIL at no obligation to you. Send today for free sample of F-#925 or S-#58M grades and Bulletin No. 559.

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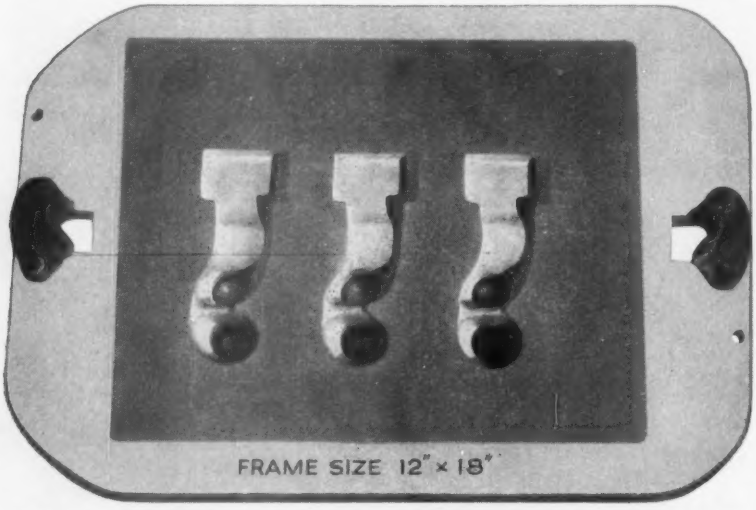
Circle 646 on Page 119



"The type of work we produce in TAMASTONE we would be unable to make at all in the absence of skilled help!"

COLUMBUS BRASS & ALUMINUM CO., INC., Columbus, Indiana

This Drier equipment pattern is for a port core box on a diesel engine and is made from an original master pattern. *Only one shrinkage!* Material is aluminum. Pattern was used for 100 Driers. Only 2 hours labor and 20 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

No special skill needed to increase production 400% or more! . . . WRITE . . .

TAMMS INDUSTRIES CO., 228 N. LaSalle St., Chicago 1, Ill.

proceedings. It seemed that everybody was suing everybody, and Mr. Hartley devotes a lengthy chapter to these rather doleful proceedings. Following the demise of the Saugus Works and the scattering of its employees, individual efforts to produce salable iron were made at a number of locations, some of which probably succeeded, but of these there would appear to be no reliable record.

As an MIT man, Mr. Hartley could have conferred with Howard Taylor, who might have contributed many helpful hints on the metallurgy of colonial iron and the foundry practice of that period. Bruce Simpson may have come across foundry facts pertinent to this investigation while he compiled his *History of the Casting Industry.* The files of the American Foundrymen's Society or of FOUNDRY also may offer information on some aspects of foundry practice from 1630 to 1700.

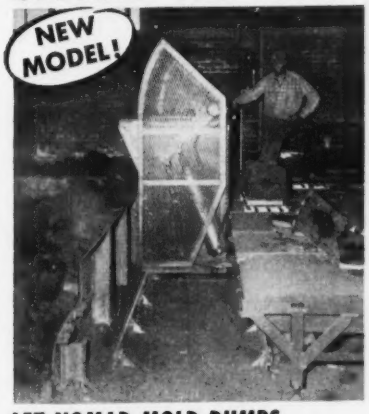
It is not my purpose to deprecate the efforts of Mr. Hartley in his *Ironworks on the Saugus.* Within the limits of his investigation and the data available, he has fulfilled admirably the job he set out to accomplish. But I do feel that foundrymen will find this book disappointing.

Secretive Foundrymen — Among historians of industry, Mr. Hartley is not alone in this tendency to ignore the foundryman. Perhaps the foundryman himself is largely responsible for the anonymity he has attained.

We know it certainly is no easy task to uncover and record accurately the details of life as they existed in New England more than 300 years ago—especially since foundrymen were notorious for their aver-

"Worst case of casting fin I've ever seen"

DUMP MOLDS QUICKLY and EASILY



LET NOMAD MOLD DUMPS DO THE HARD WORK FOR YOU!

The *new* Movable-Elevating Mold Dump runs on transfer track to serve several conveyor lines. In this way, ONE Mold Dump does the work of many and takes the place of a stationary dump at the end of each line.

As shown, this unit elevates to dump over a wall, allowing a front-end loader to remove sand and castings. Or, this same model can dump into a floor-mounted oscillating conveyor or into a bucket.

SAVE ON MANPOWER!

One operator usually handles the *entire* output of the foundry!

Effortless operation and fast dumping cycles are features which increase production and help you compete!

All Nomad Mold Dumps are sturdily built to handle a wide range of mold and flask sizes. Stationary models available.

Write for our New, Enlarged Catalog

NOMAD EQUIPMENT

NOMAD EQUIPMENT DIVISION
WESTOVER CORPORATION
3110 W. FOND DU LAC AVE.
MILWAUKEE 10, WIS.

Circle 648 on Page 119

aversion to writing down anything.

Mr. Hartley gives us excellent reason to believe that these men were steeped in secrecy, even to the shop mechanic who wouldn't let his boss share the secrets of his trade. "Men did what their fathers had done, wrapping their activities in a cloak of trade secrecy and fending off the inquiries of outsiders, regardless of who they might be—curious scientists or scholars, or even their employers." Many an apprentice in those days had to be two-thirds detective to master his craft.

After a second reading of *Ironworks on the Saugus*, I have the feeling that for foundrymen, the greatest value of this book will be found in what it implies rather than in what is revealed, and especially in the interest it inspires.

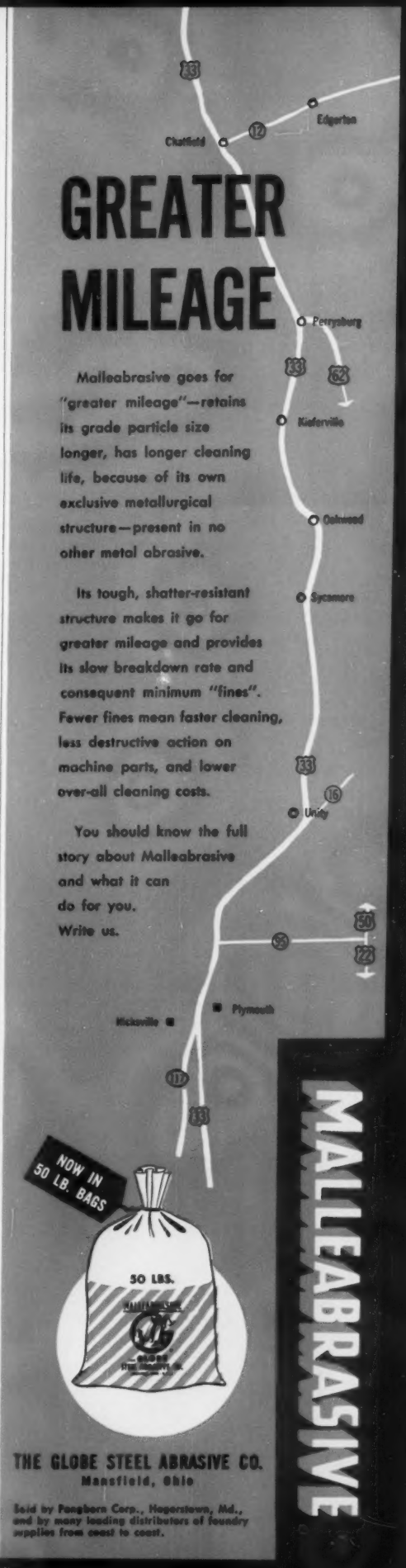
Lost Secrets — My interest in ancient foundry practice stems from a belief that the oldtimer deserves a good deal more credit than he has received. In paving the way for modern science, especially in sand practice, he recognized the limitations of the means he had inherited, and with true imaginative curiosity, he experimented with every available material that seemed promising.

It seems possible that more intensive research may reveal details of a seemingly lost art, some of which might prove well worth reviving.

Record Number Attends AFS Foundry Instructors Seminar

Record attendance was established at the third Foundry Instructors Seminar of the American Foundrymen's Society, held June 19-21, at Case Institute of Technology, Cleveland. Instructors in foundry and patternmaking at high schools and vocational schools numbered 111. This year, schools from all of the active foundry centers in the United States and Canada were represented. Some of the teachers, directors, and supervisors came from British Columbia and Mexico City. The 3-day program was devoted to teaching aids, discussion of curricula, shop layout, laboratory facilities, casting methods, techniques and applications, inplant training, career opportunities workshops, and a field trip. The fourth seminar, in the spring of 1959, will be held at Case Institute of Technology or University of Illinois.

Circle 649 on Page 119→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Malleabrasive goes for "greater mileage"—retains its grade particle size longer, has longer cleaning life, because of its own exclusive metallurgical structure—present in no other metal abrasive.
Its tough, shatter-resistant structure makes it go for greater mileage and provides its slow breakdown rate and consequent minimum "fines". Fewer fines mean faster cleaning, less destructive action on machine parts, and lower over-all cleaning costs.
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MALLEABRASIVE
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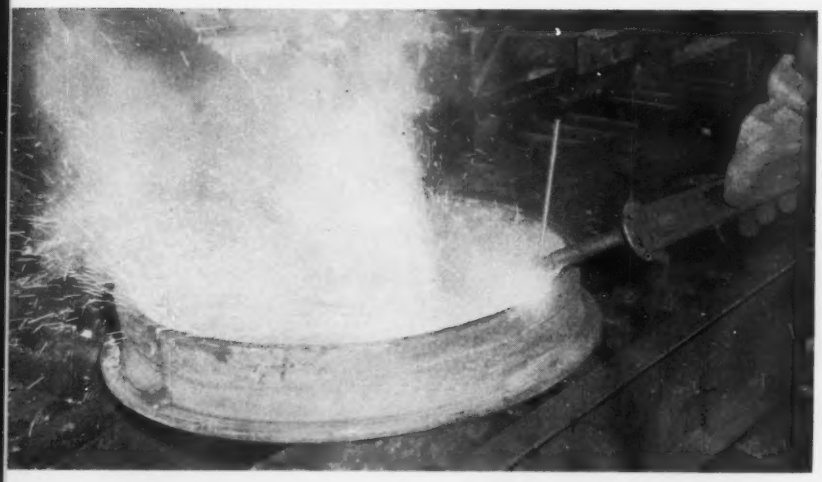
Torch Saves Time in

REMOVING RISER STUBS

Turntable arrangement speeds positioning of wheel for removal of riser stubs. Operator has torch poised to strike the arc



Preparing for wheel-breaking salvage operation, operator uses his torch to notch the outside rim of a wheel at three points

A CHANGE in metal removal methods has cut casting cleaning costs, improved product quality, promoted safety, and led to collateral work-method improvement at Griffin Wheel Co., Chicago, manufacturer of steel wheels for railroad freight cars.

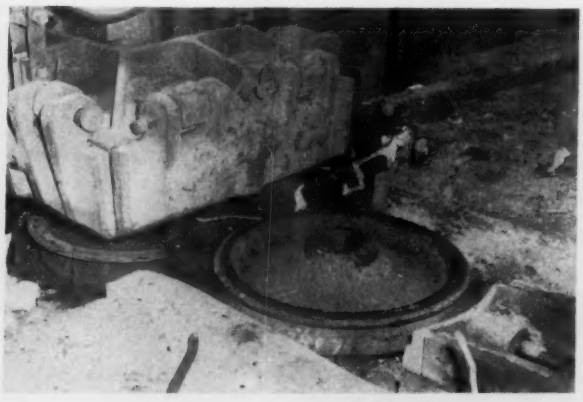
Four years ago, casting cleaning operations at the Griffin Wheel foundry followed a procedure still rather widely employed elsewhere. As rough castings emerged from molds, risers were knocked off with sledges. The remaining stubs varied from $\frac{1}{2}$ to $\frac{3}{4}$ in. in height, with diameters of $1\frac{3}{4}$ in. These stubs were removed by gas torch pad washing in a matter of 2 or 3 minutes per wheel, but there were certain disadvantages in the operation.

To eliminate these difficulties and to speed up operations, it was decided to try the Arcair torch, which combines an electric arc and ordinary compressed air to melt metal and blast it out of the electrode path. Equipment for the job consisted of a foundry model torch with $\frac{3}{8}$ and $\frac{1}{2}$-in. copperclad electrodes, a rectifier-type dc welder, and regular shop air at 95 psi.

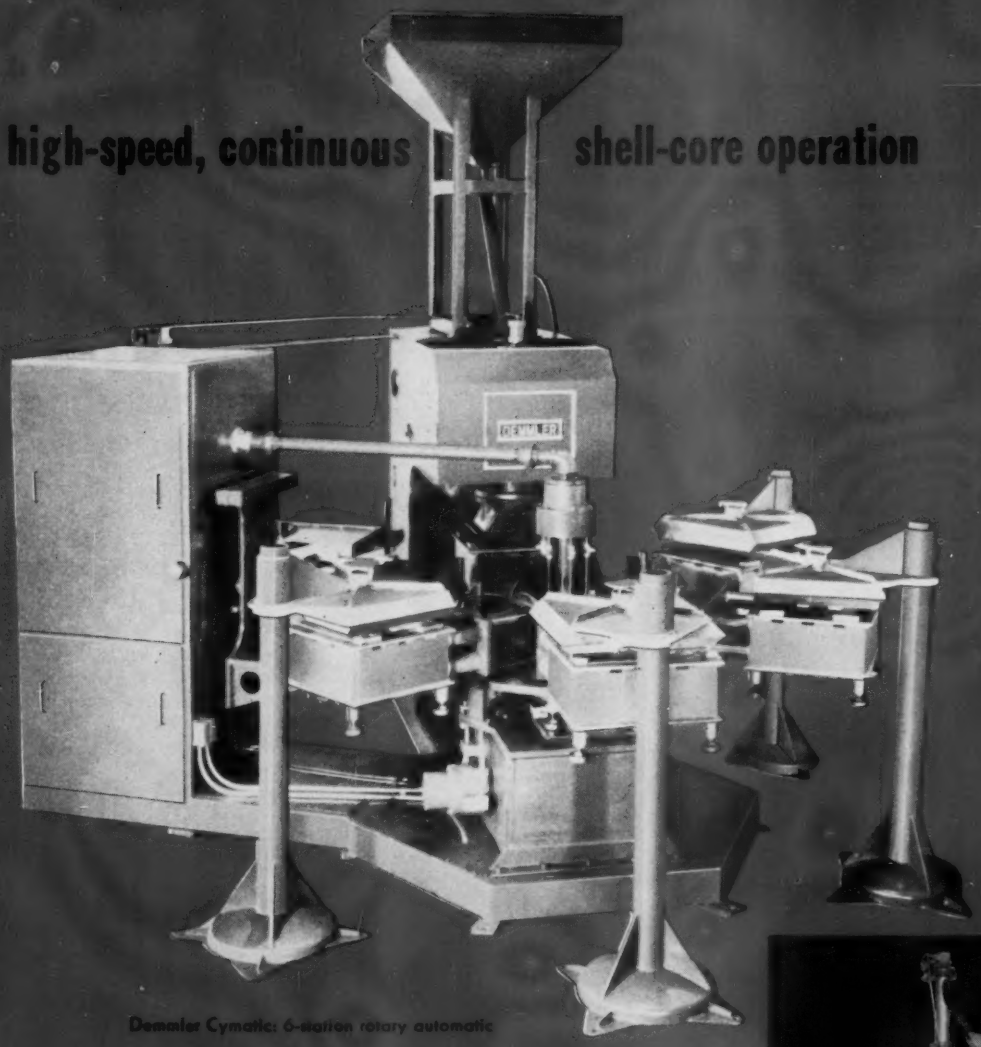
Sped Up Operation — After a short period of familiarization with the new technique, operators aver-

After a wheel has been notched as indicated, turnover arm flips it to receive blow by a hammer

Dead center hammer blow shatters wheel as another awaits its turn. Pieces are fed back into furnace



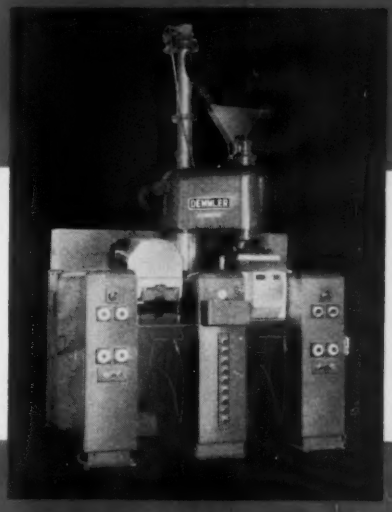
For high-speed, continuous shell-core operation



Demmler Cymatic: 6-station rotary automatic

DEMMLER "CYMATIC"

Precision shell-core equipment with new flexibility, new reliability, minimum investment



Demmler Cymatic: two-station automatic. Available in single-station models.

- Standardized short-run core boxes
- Standardized long-run core boxes
- Universal, quick-change blow plate
- Quick-change, pre-heated core boxes
- Precision heat-exchange on either half-box
- Vertical down-blow with horizontal and vertical ejection and mandrel draw

DEMMLER MANUFACTURING COMPANY

Kewanee, Illinois

Circle 650 on Page 119

HERC-ALLOY

THE ORIGINAL ALLOY STEEL CHAIN

● Herc-Alloy is a special all-purpose chain with long-wearing properties and high resistance to impact loading.

● Herc-Alloy is sold in running lengths and in all types and sizes of sling chains assembled to customers' specifications.

● CM also produces a complete line of chain attachments and welded chain of all types including stainless steel and bronze.

● Write for literature covering Herc-Alloy Sling Chains, including helpful information on their assembly, care, use and inspection.

Hammerlok®

COUPLING LINKS

● Assemble or rebuild your own Herc-Alloy sling chains with all components furnished by your local distributor. Hammerlok is simple, safe, reusable. New Herc-Alloy assemblies can now be ordered with welded or Hammerlok Coupling Links as desired.

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Regional Offices: NEW YORK • CHICAGO • CLEVELAND

In Canada: McKINNON COLUMBUS CHAIN LTD., ST. CATHARINES, ONT.

Herc-Alloy®

aged about 30 seconds per wheel, a saving of better than 75 per cent in production time over previous practice. In addition, job quality is considerably neater, and the problems of heat cracks and incendiary damage have been eliminated completely.

More recently, Griffin Wheel also has employed this torch in a wheel breaking operation, through which used wheels are prepared for remelting. In preparation for the breaking operation, the outside rims formerly were gouged at three points to a depth of about ½ in. After the success of Arcair in the stub-removal operation, however, it was decided to employ the same process in notching. The application resulted immediately in a speed-up of operations and a decrease in costs. Moreover, electrode stubs from the pad-washing operation in the foundry can be used further to do this before being discarded.

The torch is a versatile tool not only because of its operational simplicity, but also because of certain advantages inherent in the Arcair process. Because it does not depend on oxidation, the process works on metals which do not oxidize readily as well as on those that do. It introduces relatively little heat, and consequently the physical properties of alloy steels are unaffected. With dc electrodes, the torch cuts stainless as easily as it does mild steel. On cast iron and copper alloys, however, ac electrodes must be employed.

AFS Technical Council Plans Society's 1958-59 Program

James S. Vanick, International Nickel Co., New York, served as chairman of the Technical Council of the American Foundrymen's Society, which met June 5-6 at the Sherman Hotel, Chicago, to plan the technical program for society activities during 1958-59. All AFS divisions submitted progress reports for the last year and made recommendations for the new fiscal year. A total of $50,000 was requested for additional research to advance projects currently in progress: Brass and bronze, University of Michigan; malleable, University of Wisconsin; gray iron, Case Institute of Technology; light metals, Battelle Memorial Institute. Sand research is conducting seven separate projects. Work on steel research will begin as soon as contracts are let. The Pattern Division will conduct research on pattern coatings.

Maintains Profits Through Foundry Modernization . . .

"We take pride in our modern equipped foundry and maintain a profit through its efficient operation," states Mr. G. F. Langford, President of Superior Kendrick Bearings, Inc., Detroit, Michigan.

To be able to do this has meant sound planning and the employment of dependable sand handling and conditioning equipment. When it was decided to spend a considerable amount of dollars to modernize this foundry Newaygo was commissioned because of their straightforward approach to the job — realistic bidding, sound engineering, sturdy, well built equipment and dependable delivery.

In this foundry, and many others with Newaygo installations, experience shows that profits keep up with progressive mechanization. Newaygo is geared to handle large and small sand handling jobs — complete systems or component parts. Newaygo foundry-designed equipment means increased production through greater capacity and lower costs through operating efficiencies.

Molds are conveyed from the roller conveyor set-out and pouring floor to traveling shakeout cars mounted directly over a vibrating pan-type conveyor which carries sand and castings to one end of the foundry. Here, the sand is separated through a grid section in the vibrating pan and passes up a shakeout belt with an automatic water addition device and onto the processing equipment. Castings continue over the end of the vibrating conveyor where they discharge into tote boxes next to the cleaning room.

Above is a section of the Newaygo overhead sand distribution system at Superior Kendrick Bearings, etc. This particular mechanized installation serves six molders with a distribution belt conveyor feeding sand into overhead molding hoppers. Adjacent to molding stations are gravity conveyor mold set-outs and flask return lines. According to Mr. P. O. Jellby, Chief Engineer at the foundry, this equipment has helped gain a 30% increase in production, a 50% decrease in labor fatigue, and a 75% decrease in sand shoveling.

Correct planning and installation has also located the sand testing equipment adjacent to the sand conditioning units. Foundry sand tests are made frequently and in a minimum of time. Attention to this important function has meant more perfect castings and fewer rejects.

Call in your Newaygo representative regarding mold handling, sand handling and conditioning equipment. He'll show you how it can pay off in your foundry.

NEWAYGO *engineering company*

NEWAYGO, MICHIGAN

Literature for Foundrymen

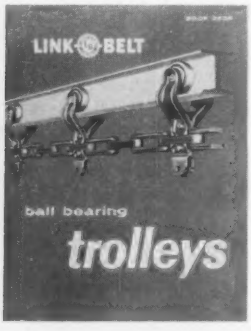
Foundry Sand Cooling

Need for cooling sand, and history of various types of equipment used for that purpose, are discussed in 12-page bulletin. Basic principles of cooling, cost of equipment, and efficiencies of different cooling devices are included in treatise written by R. L. McIlvaine, vice president, **National Engineering Co.**, 549 W. Washington Blvd., Chicago 6, Ill.

For More Details Circle No. 440—Page 169

Ball Bearing Trolleys

Data on types and sizes of trolleys, selection of new trolleys and attachments, and replacement of units in existing installations are



presented in Book 2636. Also included are application and maintenance information plus data on trolley wheels, rollers for roller turns, and special types of trolleys for electrified and heavy-duty foundry applications. — **Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 441—Page 169

Combination Welder

Folder DM-71 describes a combination alternating-current, direct-current, and inert-gas welding machine that provides all three types of welding.—**Hobart Brothers Co.**, Troy, Ohio.

For More Details Circle No. 442—Page 169

EDTA Titration Method

Comprehensive review of the ethylenediaminetetraacetate (EDTA) titration method of chemical analysis contains half a dozen articles on varying aspects of the subject, including applications, use, advantages, etc.—**J. T. Baker Chemical Co.**, Phillipsburg, N. J.

For More Details Circle No. 443—Page 169

Hot Blast Equipment

Two-color, four-page folder explains the company's two principal types of hot blast cupola equipment, the Recuperator type 204 and the indirect-fired Preheater Type 202. Drawings, installation photographs, and other data are included.—**Brown Thermal Development Co.**, subsidiary of Brown Fintube Co., Elyria, Ohio.

For More Details Circle No. 444—Page 169

Electronic Scales

Form 2907a describes electronic load cell scales and the types of accessories available with them.—**Toledo Scale Co.**, Toledo, Ohio.

For More Details Circle No. 445—Page 169

Draw Machines

Photographs, specifications, and installation data on rollover draw and jolt rollover draw machines are contained in new eight-page bulletin No. 5115. Covers pneumatically operated units of 600 to 3000 lb capacity with 12 to 20 in. draw and all-hydraulic machines of 4000 to 15,000 lb capacity, 25 to 32 in. draw. **Beardsley & Piper**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 446—Page 169

Expanding Grinding Wheel

Form C-3R presents data on an expanding grinding wheel designed for use with coated abrasive bands. —**Nu-Matic Grinders Inc.**, 8224 Carnegie Ave., Cleveland 3, Ohio.

For More Details Circle No. 447—Page 169

Spectrochemical Analyzers

Two booklets deal with spectrochemical analyzers. One covers the production x-ray Quantometer for the simultaneous determination of up to 22 elements. The other describes Quantrol, an x-ray fluorescence instrument for continuous stream monitoring of a solid, liquid, or powder on the production line.—**Applied Research Laboratories Inc.**, Box 1710, Glendale 5, Calif.

For More Details Circle No. 448—Page 169

Refractories

Catalog covers fire brick, cupola block, ladle lining, castable refractories, plastic fire brick, acid-proof cement, high-temperature bonding mortar, and kiln floor block and car tops. Specifications are included.—**Robinson Clay Product Co.**, 65 W. State St., Akron 9, Ohio.

For More Details Circle No. 449—Page 169

Hand Lift Trucks

Circular 26B in the form of a hand lift truck selector chart gives such data as lifting height in inches; type of lifting mechanism; whether

used with skids, single or open-faced pallets; operating features; capacities, and platform and fork lengths and widths.—**Lewis-Shepard Products Inc.**, Dept. R8-12, 125 Walnut St., Watertown 72, Mass.

For More Details Circle No. 450—Page 169

Flaskless Molding

Bulletin 151-NA describes hydraulically operated molding machines designed for high-speed production of light castings without the use of individual flasks. Flask equipment used in the molding operation is an integral part of the machine. Standard sizes produce 12 x 17 in. and 14

FOR MORE INFORMATION on Equipment, Supplies, and Literature described in this issue, mail one of these cards.

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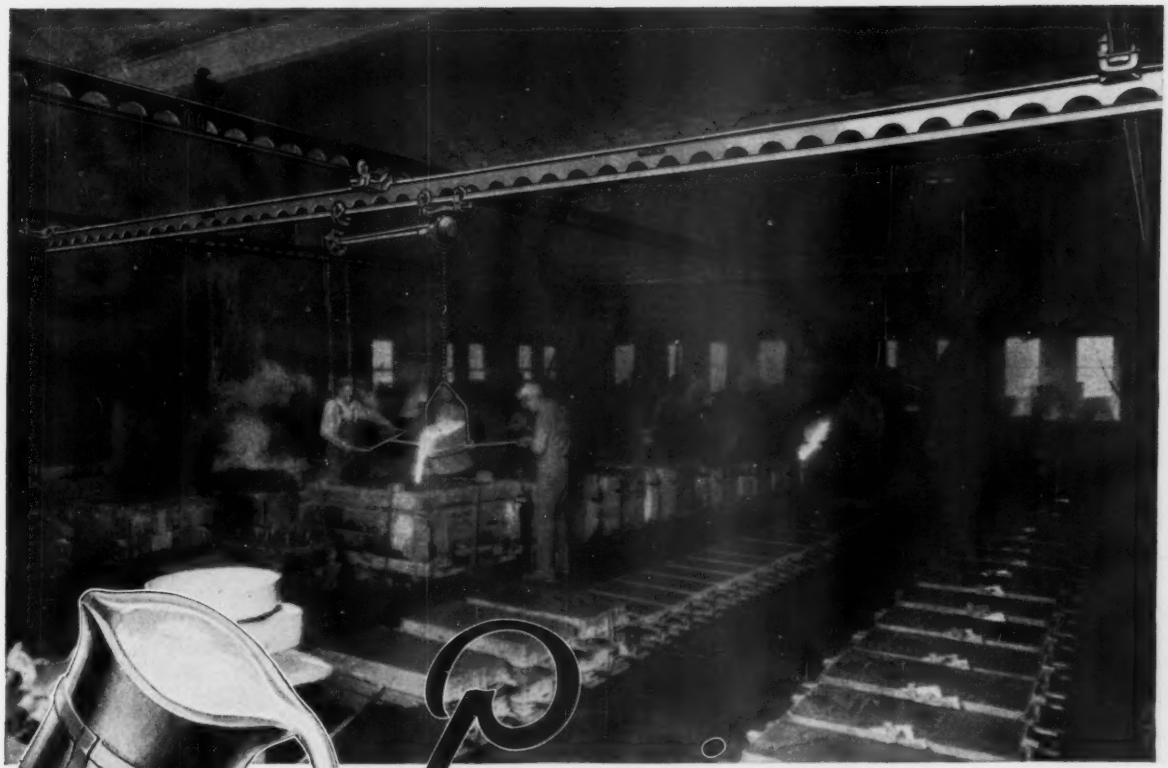

Pouring . . .

FASTER, EASIER WITH CLEVELAND TRAMRAIL

If you are thinking about tomorrow, you are giving serious thought to various ways of improving your foundry efficiency, speeding production and cutting costs. You will find Cleveland Tramrail of profound interest because, for the cost involved, there perhaps is no other important foundry equipment that will yield as profitable returns.

Pouring is just one example. Metal is tapped into a ladle on a tramrail carrier at the cupola. The ladle is then taken directly to the mold and poured. No rehandling. No spillage. No hard work. The crane or carrier rides freely and easily on the smooth overhead track.

Cleveland Tramrail equipment permits taking the ladle over the shortest route from cupola to mold without hindrance from floor obstacles. The metal is delivered with minimum heat loss.

Likewise in the handling of cores, sand, molds and castings are important economies and advantages possible with Cleveland Tramrail. Hundreds of installations in small and large foundries attest to the soundness of the overhead method of materials handling.

Our sales engineers will be glad to survey your needs. Their ideas may spell the difference between profit and loss in the coming period.

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THE CLEVELAND CRANE & ENGINEERING CO.
3824 East 286th Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 653 on Page 119

BE THRIFTY—USE SUPERFLUX!

SUPERFLUX—A favorite with many gray iron foundrymen.

SUPERFLUX D—A highly concentrated flux; very economical in water cooled cupolas; cuts down high freight charges.

LADLE FLUX—For ductile iron makers; does things to magnesium sulphide slags; granular.

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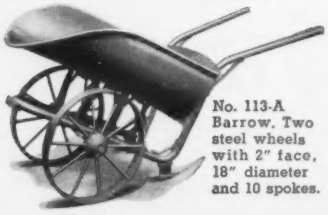
Circle 654 on Page 119

FORWARD DUMP BARROWS for FOUNDRIES

No. 102-A Barrow. Single steel wheel with 2" face, 16" diameter and 12 spokes.



No. 113-A Barrow. Two steel wheels with 2" face, 18" diameter and 10 spokes.

Here are two well-balanced charging Wheelbarrows for heavy duty foundry service. Handle loads up to 1000 lbs. Sturdy, welded, all-steel construction. Single wheel or double wheel. Available with zero pressure cushion type wheels or 4 ply pneumatic tired wheels with roller bearings. Immediate shipment.

Write for literature.

STERLING NATIONAL INDUSTRIES, Inc., Milwaukee 14, Wis., U. S. A.
Founded 1904 as Sterling Wheelbarrow Company

Sterling FOUNDRY EQUIPMENT

A-5792-½R

Circle 655 on Page 119

x 18 in. molds.—**F. E. (North America) Ltd.**, 47 Advance Rd., Toronto 18, Ont., Canada.

For More Details Circle No. 451—Page 169

Conveyor Belt Idlers

Bulletin 925 details development of permanently lubricated, sealed idlers from laboratory to installation. Features of the idlers are illustrated and described. — **Jeffrey Mfg. Co.**, Columbus 16, Ohio.

For More Details Circle No. 452—Page 169

Cast Mold Jackets

Catalog 203 describes Hi-Flex cast aluminum and cast iron mold jackets and includes price lists and other material.—**Hines Flask Co.**, 3429 W. 140th St., Cleveland 11, Ohio.

For More Details Circle No. 453—Page 169

Aluminum Alloys

Booklet offers data on properties, composition, and characteristics of Ternalloy, a series of high-strength aluminum alloys not requiring heat treatment. — **Apex Smelting Co.**, 2537 W. Taylor St., Chicago 12, Ill.

For More Details Circle No. 454—Page 169

Metal Transfer Truck

Brochure covers a molten metal transfer truck equipped with hydraulically lifted and tilted ladle.—**Monometer Mfg. Co.**, Savoy House, 115-116 Strand, London W. C. 2, England.

For More Details Circle No. 455—Page 169

Sand Rammer Butts

Neoprene sand rammer butts and peens, as well as hand ramming tools, are illustrated and described in bulletin.—**Arrow Butt Co.**, 4800 W. 139th St., Cleveland 35, Ohio.

For More Details Circle No. 456—Page 169

Bridge Cranes

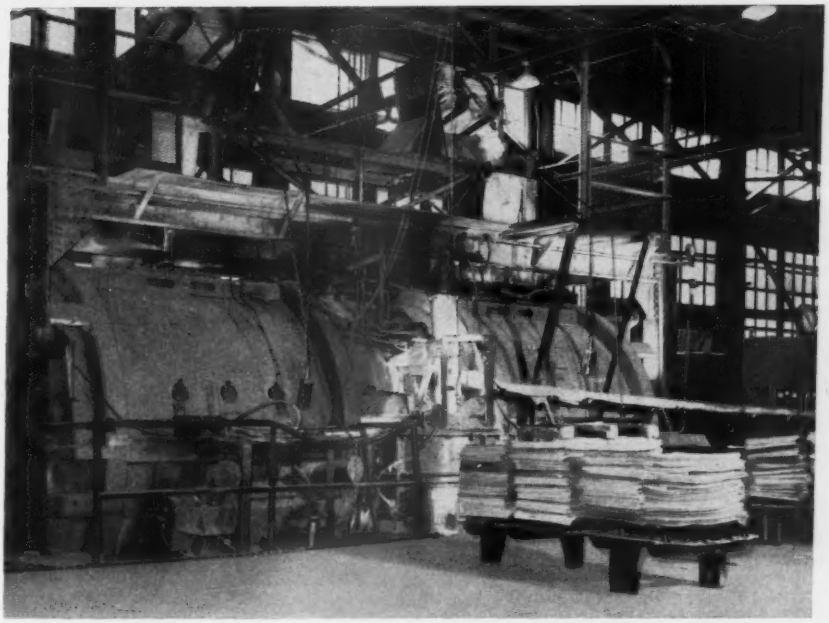
Top running, double-bridge, motor-driven cranes engineered with a safety factor of 5 to 1 are covered in Catalog DH-43B. Specifications and features of interest to plant operators and maintenance personnel are included.—**Wright Hoist Div., American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 457—Page 169

Material Level Indicators

Catalog includes photographs, cutaway and schematic drawings,

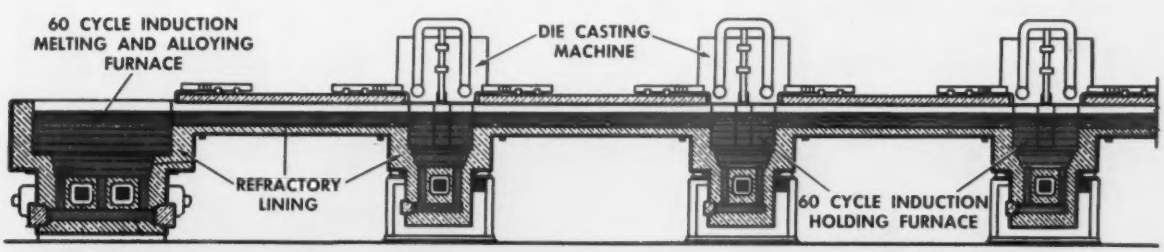
Birthplace of an Automotive Part



BUNKER HILL SPECIAL HIGH GRADE ZINC SLAB
PRODUCED IN THE AJAX FURNACE

High in the mountains of Idaho, the AJAX-TAMA-WYATT 800 kw induction furnace melts 235 tons of electrolytic zinc cathodes day after day. THE BUNKER HILL COMPANY, originators of Special High Grade Zinc, take pride in the purity (99.99+% Zn) of the slab poured from this 60 CYCLE INDUCTION MELTING unit. Such pure metal insures the soundness of the many zinc die castings used in our cars and appliances.

To maintain this purity when remelting the slab for die casting, hundreds of AJAX-TAMA-WYATT furnaces are used today in our busy industrial regions. The diagram below shows a modern zinc die casting line for automotive parts, using a central 60 CYCLE INDUCTION MELTING and alloying furnace, and holding furnaces at each machine. Connecting electric molten metal runways eliminate all metal transfer labor. Unexcelled metal quality, low metal losses, reliability and economy of operation are assured by using 60 CYCLE INDUCTION MELTING throughout.


60 CYCLE INDUCTION MELTING AND ALLOYING FURNACE
DIE CASTING MACHINE
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60 CYCLE INDUCTION MELTING

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company

Circle 656 on Page 119

Cedar Heights superior plastic bonding agents from the world's finest clay deposits hold moisture . . . help produce smooth, clean, undamaged molds with high green strength in less mulling time.

Cedar Heights clays dry out strong with a minimum of shrinkage . . . have a high refractory value to resist erosion, washing and blows.

Result: cleaner, finer finish castings produced in less time with fewer rejects.

Contact your distributor for Cedar Heights Clay products or write for free test samples.

CEDAR HEIGHTS BONDING CLAY
A plastic bonding agent produced in No. 8, 12, 16, 20, 30 and 50 meshes.

higher strength...better molds

CEDAR HEIGHTS AIRFLOATED CLAY
Highly refined, artificially dried. Ground to 200 mesh.

CEDAR HEIGHTS FIRE CLAY
High in refractory value, smooth clean texture. Produced in No. 8, 12, 16, and 20 meshes.

CEDAR HEIGHTS CLAY COMPANY

50 PORTSMOUTH ROAD
OAK HILL, OHIO

dimensions, specifications, special bin and conveyor applications, actual and suggested systems, and applications for two bulk material level indicators and an aerator.—**Bin-Dicator Co.**, 139-46-107 Kercheval Ave., Detroit 15, Mich.

For More Details Circle No. 458—Page 169

Molding Machine

Technical Bulletin JSS-5-58 explains principles of operation of new Moldmaster jolt-squeeze strip molding machine designed to meet normal molding requirements of most foundries. Specifications are included.—**Herman Pneumatic Machine Co.**, Union Bank Building, Pittsburgh 22, Pa.

For More Details Circle No. 459—Page 169

Bottom Boards

Cast aluminum bottom boards suitable for regular sand molding, ram-up work, or as core plates are described in brochure.—**Burr Aluminum Products**, Box 61, Burr Oak, Mich.

For More Details Circle No. 460—Page 169

Motor Generators

Bulletin GEA-6809, covering vertical high-frequency motor-generator sets, includes data on ratings, dimensions, and construction features.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 461—Page 169

Snagging Wheel

Bulletin describes resinoid-bonded snagging wheels for use on swing frame, automatic, floor stand, and portable grinders. — **Macklin Co.**, Jackson, Mich.

For More Details Circle No. 462—Page 169

Ovens, Dryers, Heaters

Bulletin S-4 covers ovens, dryers, and heaters used to produce engineered atmospheres for industrial applications such as core baking and hot-blast cupola operation.—**J. O. Ross Engineering Div., Midland-Ross Corp.**, 444 Madison Ave., New York, N. Y.

For More Details Circle No. 463—Page 169

Rope Belt Conveyors

Specification sheet NR-6C explains construction of the Limberope conveyor, constructed with steel wire rope instead of rigid framing. The bulletin includes descriptions and dimensions of components, plus idler and support stand spacing data.—**Joy Mfg. Co.**, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

For More Details Circle No. 464—Page 169

Sand Recovery

Bulletin on a pneumatic sand recovery system describes improvements over earlier models and contains diagrams showing how the unit operates.—**National Engineering Co.**, 549 W. Washington Blvd., Chicago 6, Ill.

For More Details Circle No. 465—Page 169

Aluminum Degasser

Leaflet B10 describes an aluminum degassing agent offered in tablet form with a hole in the middle to accommodate the plunging rod.—**Foundry Services Inc.**, 2000 Bruck St., Columbus 7, Ohio.

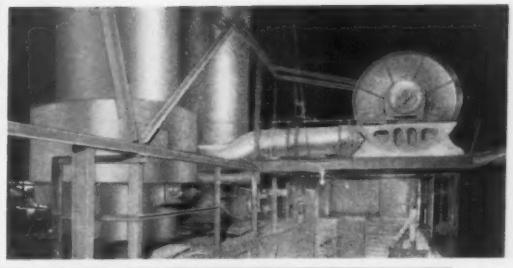
For More Details Circle No. 466—Page 169

Conveyor System

Case History 102 describes a conveying system which carries hot cast pipe fittings at the rate of 12 tons an hour from mold dump-out

VITAL *to any foundry*

...a healthy heart



...and strong lungs

reliable SPENCER blowers

When lungs fail, the heart stops. So, too, the cupola—"heart" of any foundry—must have *dependable* air supply.

That's why—where air delivery *must not fail*—you'll invariably find SPENCER blowers.

They have been first choice of leading cupola manufacturers and foundrymen for fifty years . . . and for sound reasons, including . . .

- SIMPLE, RUGGED DESIGN
- LOW MAINTENANCE
- RELIABLE OPERATION
- ACCURATE AND INSTANTANEOUS CONTROL

Request Bulletin 112-B.

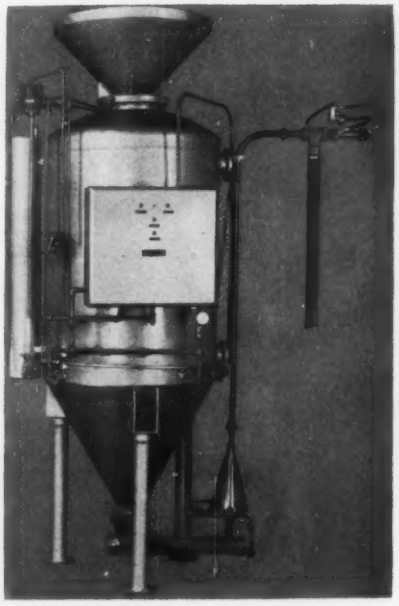
ALSO MANUFACTURERS OF INDUSTRIAL PORTABLE VACUUM CLEANERS.

SPENCER HARTFORD

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

Revolutionizes Sand Systems

the
HARTLEY
BOND FEEDER
- MEASURES
- TRANSPORTS
- SPEEDS-UP



Hartley,—originator of automatic moisture controls for sand systems, invites inquiries on its newest development illustrated here. Hopper sizes start at 28 cu. ft. Bond is transported to mixer in precisely measured quantities which can be changed instantly. May be located at floor level, or below, any distance from mixer. Ideal for multiple mixing units operating from same hopper.

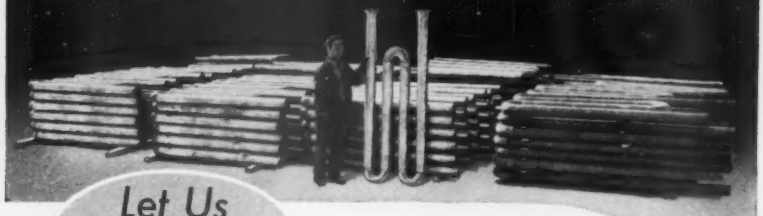
HARTLEY *Controls* CORPORATION

SPECIALISTS IN FOUNDRY CONTROLS

NEENAH • WISCONSIN

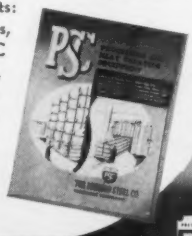
Circle 659 on Page 119

PSC Sheet Alloy Radiant Tubes COST LESS • LAST LONGER



Let Us Demonstrate This

If you are using cast alloy tubes, we can quote you substantially less on our all-sheet alloy tubes. And, with dies on hand for many commonly used sizes of return bends, we can frequently save our customers this important cost. Records of scores of installations show PSC "Thin Wall" tubes are giving much longer service life. For instance, Michigan Malleable Iron Co. reports: "We show an average life of over 3½ years for your fabricated tubes, which is about double our experience with cast alloy tubes". In PSC tubes the return bends are of the same metal and thickness as the legs, promoting uniform flow of gas and minimizing carbon build-up and consequent burn-out. Precision-assembled in any design or dimension. Also sheet-alloy heat-treating retorts and covers, boxes, baskets, fixtures, tubes, etc. We invite your inquiries.



Send for PSC Heat-Treat Catalog 54

THE PRESSED STEEL CO. • Wilkes-Barre, Pa.

Circle 660 on Page 119

through horizontal and vertical planes to a shakeout screen.—**Fairfield Engineering Co.**, Marion, Ohio.

For More Details Circle No. 467—Page 169

Self-Dumping Hoppers

Self-dumping hoppers designed for front or side dumping, in perforated or plastic or rubber-coated models, pallet-mounted for handling by a variety of trucks, skid-mounted, or caster-mounted for pushing or hauling, are described in folder.—**Welding & Fabricating Corp.**, 30 Interstate St., Bedford, Ohio.

For More Details Circle No. 468—Page 169

Refractories

High - alumina refractories for high-temperature furnaces are discussed in bulletin. General characteristics, properties, and typical uses are described.—**Walsh Refractories Corp.**, 101 Ferry St., St. Louis 7, Mo.

For More Details Circle No. 469—Page 169

Zirconium Data

Brochure contains general information, technical data, and illustrations pertaining to zirconium oxides and refractories and their applications.—**Zirconium Corp. of America**, Solon, Ohio.

For More Details Circle No. 470—Page 169

Pneumatic Products

Catalog 616 on air line filters, regulators, and lubricators gives engineering and operational data, including performance characteristics, quick-sizing charts, and specifications.—**Watts Regulator Co., Industrial Division**, Lawrence, Mass.

For More Details Circle No. 471—Page 169

Conveyor Maintenance

Pocket-sized device called a "Conveyor Belt Trouble-Shooter" is designed to help locate probable causes of conveyor troubles. It also lists specific cures.—**Conveyor Products, Mechanical Goods Div., United States Rubber Co.**, Passaic, N. J.

For More Details Circle No. 472—Page 169

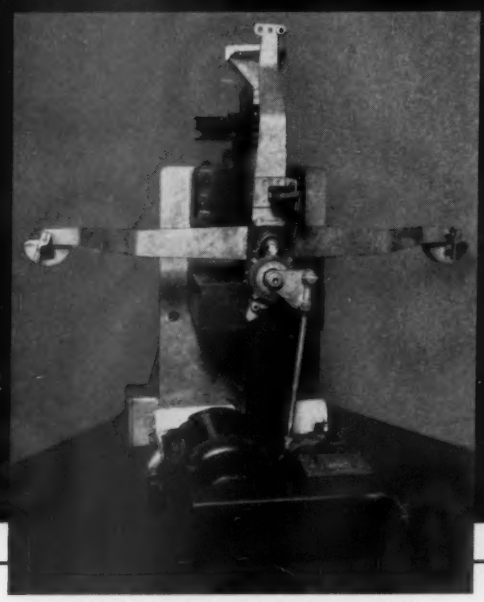
Sand Mullers

Bulletin 1230 on sand mullers gives capacity, performance, and other data. Muller control devices also are described.—**Beardsley & Piper Div., Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 473—Page 169

CLEVELAND is the name and the place for ABRASIVES

Why not buy Abrasives on Fact?



Here at Cleveland, we feel that a buyer of metallic abrasives should be able to do just that.

The breakdown tester we use is shown herewith, and it's designed to separate the fact from the fiction.

After 100 passes through this tester, at 7200 r.p.m., we *know* how good our abrasives are and how long they will last.

This tester, combined with our other extensive laboratory equipment, is an integral part of our production control system.

All of it, of course, is working hard every day to give you top-quality, long-life, economical Metallic Abrasives . . . based on fact.

There are more details in our catalog, which is yours for the asking.

COMPARATIVE TEST REPORT

MATERIAL TESTED — S660 CHILLED IRON SHOT

A – Cleveland Metal Abrasive B – Competitors C – Competitors

SCREEN ANALYSIS

U.S. No.	S.A.E. Spec.	A	B	C
8	0	0	0	0
10		35.5	54.0	36.0
12	85	60.3	36.2	48.0
14	12	4.2	7.7	14.0
Pan	3	0	1.1	2.0

CHEMICAL ANALYSIS

	A	B	C
T.C.	2.72	3.29	2.42
Si	1.13	1.36	1.20
Ph	.056	.380	.130
Mn	.40	.36	.47
S	128	.176	.141

Rc HARDNESS

	A	B	C
Low	58	59	57
High	62	65	62
Average	60	63	59

BREAKDOWN TEST

Thru U.S. No. 10 on U.S. No. 12 — No. of Grams Tested—100 — 100 Passes at 7200 R.P.M.

	A	B	C
12	0	0	0
14	.2	0	.1
16	.4	0	.5
18	4.8	.1	3.5
20	15.6	.2	9.4
25	24.4	7.9	20.7
30	13.5	8.4	12.1
35	9.9	10.6	11.5
40	4.1	11.3	6.0
45	2.7	7.1	4.6
50	2.0	14.2	3.4
Pan	13.7	27.6	17.8
Loss	8.7	12.6	10.4

Remarks — C.M.A. material best by test. *B.M.*

CLEVELAND ABRASIVES

1. Realsteel Shot and Grit 2. Pearlitic Malleable 3. Normalized
4. "A" Iron 5. Hi-Strength "B" 6. Chilled Iron 7. Drawn Steel

World's Largest Producer of Metallic Abrasives

CLEVELAND *metal abrasive co.*

General Office: 888 East 67th Street • Cleveland 8, Ohio

Plants at: Howell, Michigan; Toledo; Cleveland; Northfield, Ohio

Circle 661 on Page 119

High-speed Sodium Silicate-CO_2 process is used for making molds for hangar-door counterweights at St. Paul Foundry and Manufacturing Co., St. Paul, Minn. In this "book" molding operation, 30 parts are made with one pour in clamping jacket (*above right*).

These 4 men make 680 rigid, accurate molds in 6 hours with the

SODIUM SILICATE-CO_2 process

Greatly increased production of grey iron castings at the St. Paul Foundry and Manufacturing Co. is credited to the sodium silicate-CO_2 process. The binder used is Archer-Daniels-Midland's "Adcosil," based on Du Pont Sodium Silicate; CO_2 is the curing agent.

Curing takes so little time that 4 men turn out 680 accurate molds in 6 hours for 20 tons of poured metal! Other processes—like green-sand molding—require up to 12 men, yet still can't match CO_2 output. St. Paul Foundry workers prefer CO_2 molding because there are no objectionable fumes. Management likes the extremely close tolerances of the molds—possible because the sand hardens while in *direct contact with the pattern.*

Perhaps your operation can profit with the sodium silicate-CO_2 process, just as the St. Paul Foundry does. Ask your foundry supplier for full details about this timesaving process, or write to Du Pont for names of suppliers of binders based on Du Pont sodium silicate.

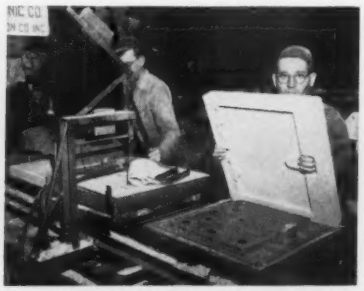
E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Dept., Rm. N-2533, Wilmington 98, Delaware.

DU PONT SODIUM SILICATE

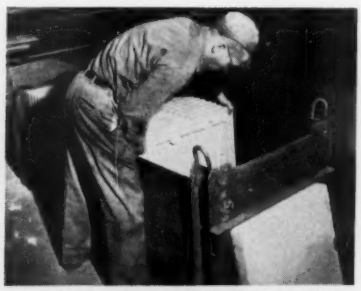
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

CORE BLOWER forces sand into pattern mold, forming an exact duplicate. St. Paul uses mixture of sand and "Adcosil," a binder made by Archer-Daniels-Midland, Cleveland, Ohio.



HARDENED IN SECONDS—12-second CO_2 gassing reacts with sodium silicate to harden mold while still in pattern. Cured mold won't crack when lifted, is rigid enough to stand on edge without damage.



NO COSTLY SET-UP EQUIPMENT—Molds are placed in clamping jacket for metal pouring. Castings cool overnight. Next morning "books" are shaken out, and jackets made ready for next pouring.

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1956	794,581	171,181	245,421	376,230	.....
1957					
May	65,108	12,705	20,708	31,602	94,748
5 mo.	350,369	68,473	106,728	174,121	.....
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
Sept.	58,692	11,367	17,820	24,900	93,720
Oct.	64,140	11,570	20,543	31,936	91,817
Nov.	58,898	10,411	18,611	29,793	91,860
Dec.	53,102	9,302	16,724	26,978	86,323
Total	751,656	144,151	232,326	369,086	.....
1958					
Jan.	57,845	10,724	18,082	28,937	77,067
Feb.	50,695	9,601	15,456	25,279	75,647
Mar.	50,547	9,311	15,255	25,918	63,600
Apr.	44,948	9,531	13,369	21,956	60,317
May	44,093	9,312	13,648	21,091	59,666
5 mo.	248,128	48,479	75,810	123,181	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1956	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
May	76,504	46,277	63,058	38,072	13,446	8,205	79,787
5 mo.	398,793	244,145	330,708	204,518	68,065	39,627	.....
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,100	27,290	12,648	7,586	80,694
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
Sept.	62,457	38,397	52,281	31,658	10,176	6,739	83,385
Oct.	77,667	45,989	66,043	39,269	11,624	6,720	82,995
Nov.	67,904	38,085	55,564	31,036	12,340	7,049	80,074
Dec.	60,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Jan.	62,734	34,920	51,440	28,516	11,294	6,404	67,292
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	59,047
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	54,330
Apr.	50,695	29,388	41,794	23,605	8,901	5,783	47,664
May	48,306	26,656	40,092	21,710	8,214	4,946	46,603
5 mo.	268,083	151,594	222,173	123,545	45,980	28,049	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1956	966,306	866,545	57,522	.....
1957				
May	75,347	67,251	4,421	46,791
5 mo.	384,041	343,198	21,880	.....
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
Sept.	70,804	64,470	3,243	40 298
Oct.	81,836	74,391	3,693	39,063
Nov.	70,187	63,944	3,006	34,249
Dec.	65,708	59,606	3,046	31,509
Total	875,389	788,319	44,696	.....
1958				
Jan.	69,707	63,294	3,327	30,341
Feb.	58,356	52,579	3,202	27,243
Mar.	60,157	54,007	3,395	25,434
Apr.	59,311	53,271	3,385	25.621
May	57,506	51,634	3,077	22,867
5 mo.	305,037	274,785	16,386	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1956	36,168	33,580	.....
1957			
May	2,832	2,706	7,188
5 mo.	14,566	13,723	.....
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
Sept.	2,279	2,071	5,705
Oct.	2,192	2,093	5,318
Nov.	1,920	1,806	4,802
Dec.	1,533	1,408	4,823
Total	30,322	28,452	.....
Jan.	1,881	1,756	5,227
Feb.	1,803	1,730	5,589
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
May	2,422	2,196	5,200
5 mo.	10,296	9,683	.....

PRODUCTION WORKERS

Estimated Number

	April 1958	March 1958	April 1957
Ferrous	159,000	165,400	199,900
Nonferrous	48,900	51,200	65,600

Average Weekly Earnings

Gray Iron	$78.85	$79.39	$82.78
Malleable Iron	80.42	83.17	82.01
Steel	87.84	89.28	96.98
Nonferrous	88.86	89.71	89.95

Average Weekly Hours

Gray Iron	35.2	35.6	38.5
Malleable Iron	35.9	36.8	38.5
Steel	36.6	37.2	41.8
Nonferrous	38.3	38.5	39.8

Source: Bureau of Labor Statistics.

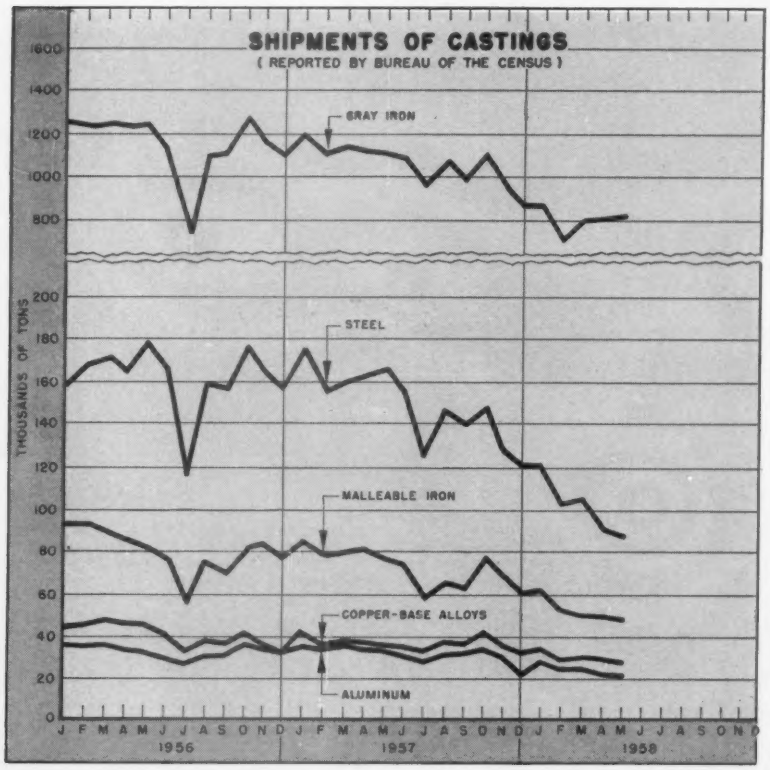
GRAY IRON CASTINGS—SHIPMENTS (Net tons[1])

	All Castings		Miscellaneous Castings		Nodular Iron Castings	Heavy Steel Ingot Molds	Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	Total	Total	Total[3]	Total[3]	
1956	13,860,527	7,963,135	8,265,526	3,650,735	.....	2,624,146	406,191	1,746,902	817,762	.....
1957										
May	1,112,096	625,496	674,460	291,557	11,206	192,336	34,406	141,685	69,209	879,825
5 mo.	5,681,924	3,065,747	3,554,904	1,517,552	.....	1,091,397	169,598	568,770	297,254	.....
June	1,058,464	599,494	630,513	274,115	10,207	193,640	32,087	131,360	70.864	853,012
July	954,102	523,489	565,897	243,187	10,901	190,434	31,209	106,532	60,030	825,676
Aug.	1,075,957	596,779	630,130	265,185	10,339	205,655	28,976	138,209	72,987	825,676
Sept.	990,139	563 477	579,444	259,649	10,253	202,914	23,681	119,689	64,411	805 301
Oct.	1,099,554	601,109	668,895	282.024	11,974	210,521	26,306	122,149	71,683	740,169
Nov.	940,138	482,732	599,292	242,847	10,601	166,652	24,302	91,138	58,754	704,623
Dec.	864,226	443,670	557,154	226,356	9,810	148,074	23,173	73,500	62,325	675,838
Total	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758.308	.....
1958										
Jan.	868,255	436,398	580,545	229,014	10,800	135,110	23,511	78,863	50.226	638.069
Feb.	753,306	389,708	503.175	203.717	10,245	116,168	25,959	67,606	40.398	632.490
Mar.	795,568	446,822	499,751	215.916	9,485	125,887	24,777	87,716	57,437	589,912
Apr.	806,720	457,498	483.999	210.344	8,015	121,489	25,401	112,292	63.539	582.446
May	820,054	472,192	469,026	203,025	5,671	134,312	23,498	123,017	70,201	570,293
5 mo.	4,043,903	2,202,618	2,536,496	1,062,016	44,216	632,966	123,146	469,494	281,621	.....

STEEL CASTINGS—SHIPMENTS (Net tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1956	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
5 mo.	811,299	629,889	149.841	609.017	469,626	139,032	202,282	160.263	10,755	.....
June	153,647	119,353	31,338	116,759	91,009	28,766	36 888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33.641	113,167	86,407	31,639	32,759	24,673	2,002	471.190
Sept.	139,002	105 611	29,718	106,261	80,871	27,885	32,741	24,740	1,863	438,510
Oct.	146,397	113,216	31,477	110,100	85,144	29,320	36 297	28,072	2,157	395,907
Nov.	127,115	98,436	26,892	93.343	71,846	25,105	33,772	26,590	1,787	362,948
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Jan.	120,722	94,717	22,545	87,525	68,203	21.115	33,197	26,514	1,430	304,907
Feb.	103,297	79,708	16.647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
Apr.	91,464	69,121	11,956	65,639	48 998	11,107	25,825	20,123	849	229,503
May	87,002	66,086	10,416	61,105	45,967	9,463	25,897	20,119	953	211,346
5 mo.	508,718	391,827	77,744	366,116	280,157	72,198	142,602	111,640	5,546	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1956	74,454,264	73,814,941	2,856,395
1957			
May	6,631,807	6,521,105	220,063
5 mo.	33,036,377	33,124,614	1,152,075
June	6,361,611	6,317,615	188,877
July	6,501,595	6,375,616	180,698
Aug.	6,519,973	6,401,949	206,907
Sept.	6,296,519	6,186,475	199,226
Oct.	6,275,567	6,120,485	208,720
Nov.	5,615,746	5,425,296	199,052
Dec.	5,164,965	5,099,556	173,470
Total	75,772,353	74,961,606	2,509,025
1958			
Jan.	4,762,050	4,643,022	192,098
Feb.	4,078,728	4,030,849	171,362
Mar.	4,343,326	4,208,343	168,194
April	3,837,040	3,597,518	152,935
May	3,898,240	3,732,057	157,798
5 mo.[3]	20,919,224	20,211,397	842,267

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1957	1958
Jan.	25,681	20,468
Feb.	20,769	17,413
Mar.	21,948	18,825
Apr.	23,507	18,009
May	22,037	17,191
June	18,888	17,962
July	16,695	.....
Aug.	19,654	.....
Sept.	19,670	.....
Oct.	22,800	.....
Nov.	19,767	.....
Dec.	16,875	.....
Total for year	248,291	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOYS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1956	693,728	449,516	.....
1957			
May	53,565	35,676	66,712
5 mo.	297,682	189,839	.....
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
Sept.	47,736	33,838	68,122
Oct.	62,332	39,990	69,275
Nov.	58,689	35,005	63,665
Dec.	49,597	29,998	58,792
Total	663,600	425,334	.....
1958			
Jan.	50,568	30,368	55,883
Feb.	42,687	27,482	50,676
Mar.	39,719	26,782	43,366
Apr.	35,796	23,830	27,634
May	36,447	24,588	33,438
5 mo.	205,217	133,050	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1957	1958
Jan.	117.9	57.9
Feb.	188.4	57.6
Mar.	127.0	85.9
Apr.	101.1	88.7
May	136.2	136.1
June	187.5	....
July	98.6	....
Aug.	231.3	....
Sept.	113.9	....
Oct.	145.3	....
Nov.	59.6	....
Dec.	61.4	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1956	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Apr.	5,816,309	835,027	97,289	807,922
4 mo.	24,779,587	3,328,348	386,507	3,473,413
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
Aug.	5,299,543	765,877	81,941	759,517
Sept.	5,033,998	721,125	82,948	672,597
Oct.	5,333,767	817,338	91,766	718,791
Nov.	4,858,489	716,095	72,871	589,879
Dec.	4,281,414	661,918	70,091	542,008
Total	65,688,592	9,220,405	1,026,951	8,876,400
1958				
Jan.	4,072,071	704,654	76,989	566,225
Feb.	3,491,441	611,394	64,971	466,657
Mar.	3,718,132	624,165	64,866	524,035
Apr.	3,429,121	599,427	61,839	531,220
4 mo.	14,710,765	2,539,640	268,665	2,088,137

PIG IRON PRODUCTION AND CONSUMPTION

	Production**—Net Tons: Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption*—Gross Tons: Total	Cupola	Air	Electric
1956	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	66,967,618	4,786,011	261,377	211,193
1957									
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
6 mo.	41,263,657	1,123,251	1,947,684	34,346,926	3,845,796	.....	.....	.....	.....
July	6,625,901	221,929	336,590	5,515,736	551,646	5,558,702	306,119	14,735	17,992
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	5,769,995	349,988	17,540	25,948
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	5,645,036	321,728	17,084	28,638
Oct.	6,454,450	164,944	303,104	5,390,851	595,551	5,669,624	354,364	18,466	24,691
Nov.	5,711,242	153,722	290,547	4,759,255	507,718	5,073,898	309,674	14,886	17,199
Dec.	5,212,624	165,268	228,897	4,394,869	423,590	4,565,635	288,219	14,754	13,881
Total[3]	78,557,011	2,275,789	3,697,335	65,131,684	7,452,203	67,902,434	4,160,891	218,178	246,851
1958									
Jan.	4,785,269	100,097	232,802	4,036,451	415,859	4,208,692	306,794	16,102	14,426
Feb.	4,016,276	106,921	193,429	3,396,382	319,094	3,551,679	260,940	14,014	7,740
Mar.	4,418,778	156,386	227,785	3,645,353	389,254	3,824,140	270,214	13,472	8,753
Apr.	3,787,907	136,180	173,139	3,053,634	424,954	3,429,191	262,007	13,975	9,585
May	4,048,328	127,438	165,045	3,359,836	396,009	.....	.....	.....	.....
June	4,396,285	121,869	167,192	3,764,607	342,617	.....	.....	.....	.....
6 mo.[3]	25,452,683	748,891	1,125,750	21,332,775	2,245,267	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Fort Pitt Steel Casting Div. cuts cleaning costs with giant 72 ft. Pangborn ROTOBLAST®

AT FORT PITT . . .
Fort Pitt Steel Casting Division, Pittsburgh Steel Foundry Corporation, McKeesport, Pa., uses the 72 cu. ft. Pangborn Rotoblast Barrel to apply the economies of barrel-type cleaning to large-size castings. This machine Rotoblasts *70 to 80 tons of castings a day.*

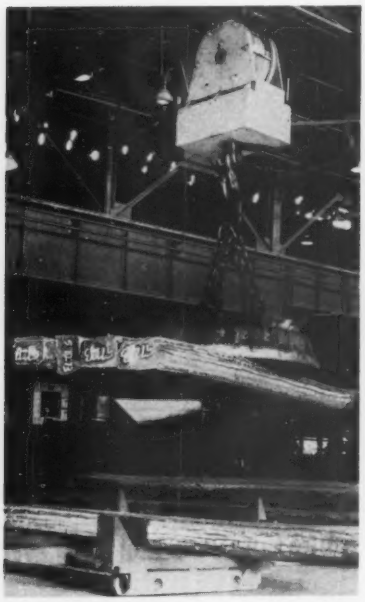
IN *YOUR SHOP* . . .
The Pangborn Engineer in your area will be glad to take off his coat and go to work on *your* cleaning problem at no obligation. For full details on Rotoblast Barrels, write to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.
Manufacturers of Blast Cleaning & Dust Control Equipment.

Pangborn Rotoblast Barrels are available in 1½, 3, 6, 12, 18, 20, 32, 72 and 102 cubic foot sizes.

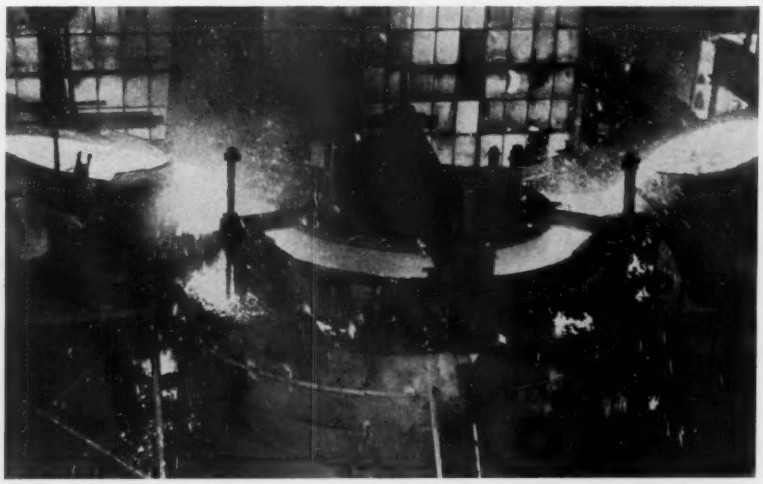
Clean it fast with **Pangborn** ROTOBLAST

Circle 663 on Page 119

News Views

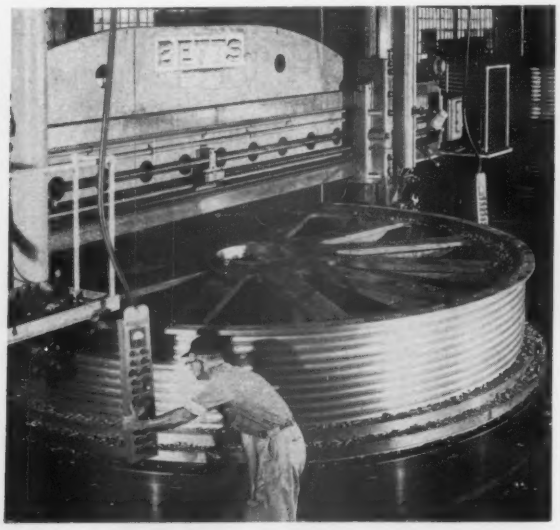


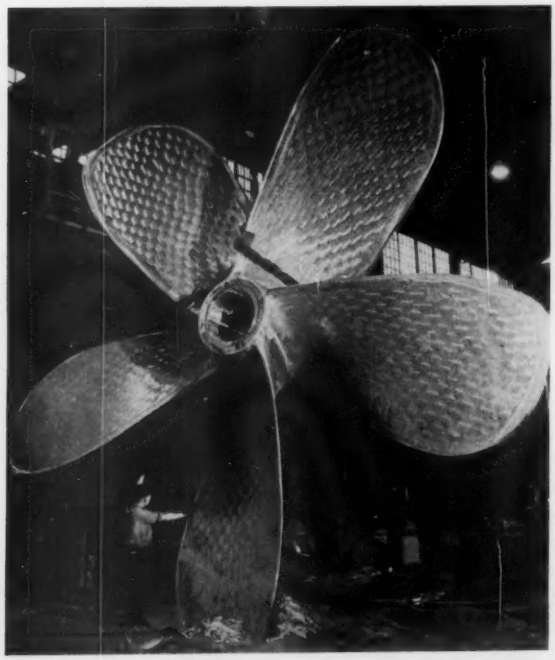
MAGNET TURNERS: Mechanical magnet turners on overhead cranes are providing greater safety, faster movement, better control, and lower operating cost at Steel & Tube Div., Timken Roller Bearing Co., Canton, Ohio. The turner can rotate loads continuously in either direction.



POURING A BIG ONE: The 37-ton Yankee dryer roll casting shown here being poured at the foundry of Pusey & Jones Corp., Wilmington, Del., is the largest casting poured at the plant in more than ten years. Pusey & Jones has the capacity to pour castings as large as 50 tons

SHEAVE CASTINGS: This 60,000-lb steel casting, made at the Coraopolis, Pa., foundry of Blaw-Knox Co., Pittsburgh, is one of eight sheaves for the longest vertical lift bridge in the world, the Arthur Kill railroad bridge between Staten Island and New Jersey. Grooves 1 3/16 in. deep and 2⅜ in. long are machined in it on a 20-ft vertical boring mill.





GIANT PROPELLERS: This giant propeller measures 24 ft 8 in. and weighs 38 tons finish machined. Three like it are being manufactured at Eddystone Div., Baldwin-Lima-Hamilton Corp., Eddystone, Pa., for super-tankers now under construction in Japan by Welding Shipyard Div., National Bulk Carriers Inc. The tankers will be 940 ft long with 135-ft beam and will weigh 104,500 dead tons

Walkway to efficient dust control

Pangborn Cloth Bag Dust Collector on the job. This is just one of Pangborn's complete line of wet and dry dust collectors.

See those bags? They're the *collect* in the Pangborn Cloth Bag Dust Collector. And they're efficient! The cloth filter has proved the most practical method for collecting finely divided dry dusts. But Pangborn goes a step further. Pangborn engineering has not only adapted this design to increase its collecting effectiveness but has simplified its construction. This means you save money. The Pangborn Cloth Bag Collector offers maximum efficiency, yet is economical to buy, install and operate.

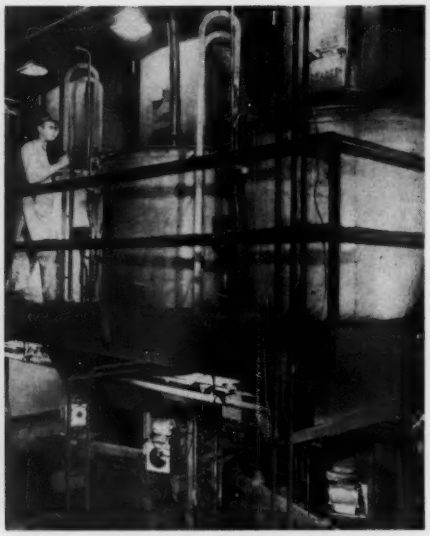
Pangborn engineering is important to every dust-producing plant, regardless of the kind of collector needed. It is not enough to put a dust collector within a plant. An efficient dust collecting system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *1400 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

Circle 664 on Page 119

Seacoal and bentonite from bags enter pneumatic conveyor and are blown to storage bins 45 ft above, at the mulling station



Storage bins at mulling station receive materials from the conveyor

Pneumatic Handling of Bulk Materials

Shell molding resin is emptied from drums with suction nozzle, drawn into conveying line, and lifted to storage bin overhead

PNEUMATIC handling of bulk materials is bringing a variety of benefits to foundries which have made such installations. These benefits include dust-free handling, safe operation, lower labor costs, elimination of contamination, and little or no maintenance problems. Here's how pneumatic handling works at three typical foundries:

Slurry Ingredients—At one plant, a pneumatic conveyor transfers seacoal and bentonite from bags to a mulling station where slurry for molding sand is prepared. During normal plant operation, the system conveys about 200 bags of each material daily in approximately 16 hours.

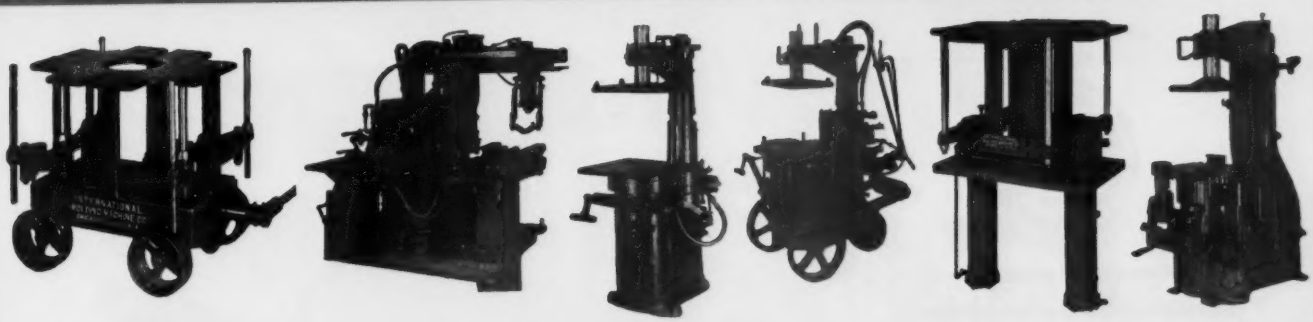
A hopper equipped with a knife edge on the tray receives materials from bags. The operator places a bag on the tray and pushes toward the hopper. The knife slits the bag, and the material drops down into the hopper, where a rotary feeder introduces it into the conveying line. A sheet metal hood above the intake hopper draws in the dusty air that results when materials are dumped.

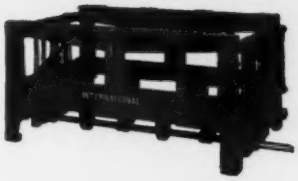
A gear-type blower creates the moving airstream in the line. This airstream blows the material from the intake point to the storage bins at the mulling station, at an elevation of 45 ft. Selection of the proper bin for the material being handled is made by the operator through a manual hose selector.

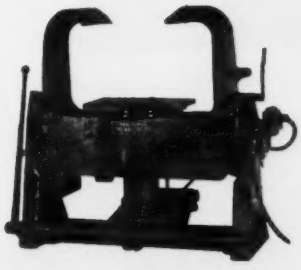
Air pressure buildup in the bins is relieved by exhausting the conveying air through filters mounted over each of the bins. These filters trap material in cloth filter bags and prevent entrained particles from escaping into the plant atmosphere. Filters are shaken down periodically to recover the dust, which is usable material.

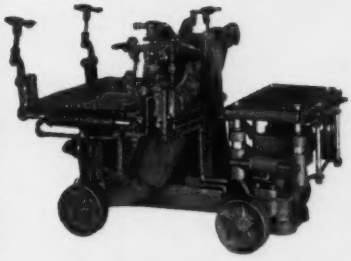
This system has been in use for two years, and these advantages are reported: 1. It has increased safety by elimination of manual handling and complete absence of external moving parts. 2. Materials are not contaminated even though the same conveyor moves more than one material. The moving airstream keeps the interior clean. 3. Plant air is kept clean because dust from handling operations does not escape. 4. The system has provided a simple, labor-saving means of conveying bulk materials that can be operated by one man with little training.

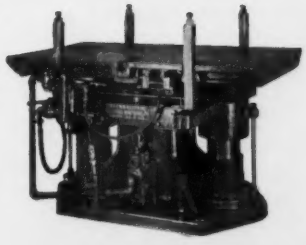
Moves Shell Molding Resin—A second foundry uses a pneumatic conveyor to unload drums of resin used in shell molding. This resin

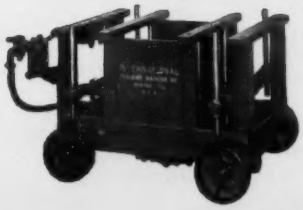












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GRINDERS

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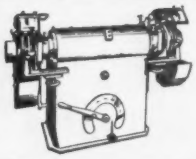
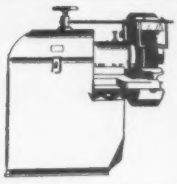
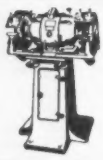


Gear Drive

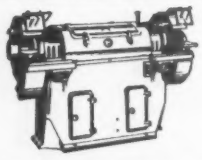
Vari-Speed Single or Dual





Direct Drive

Belt Drive



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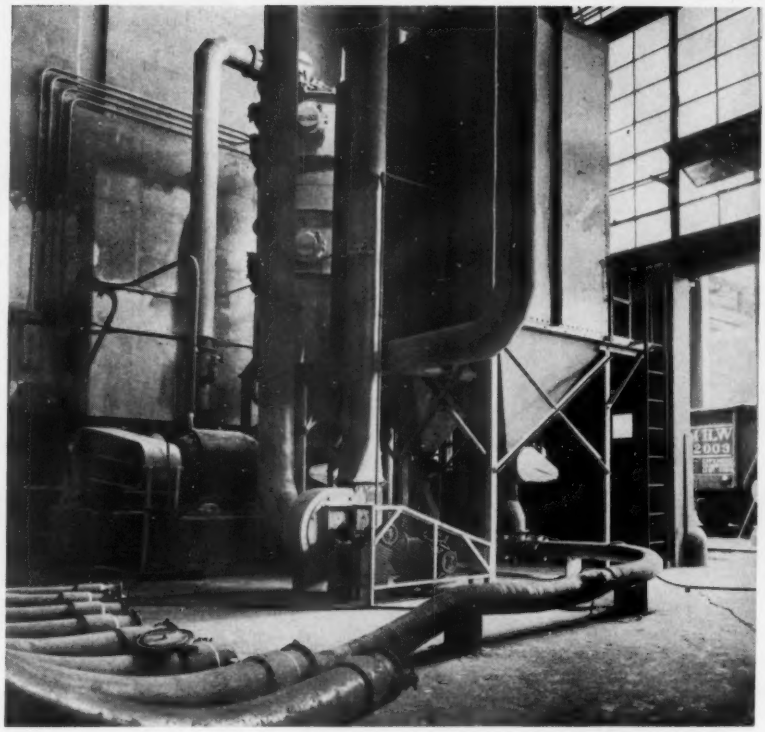

Core binders received in boxcars or hopper-bottom cars are drawn through conveying line to receiver and blown to correct storage bin via selection system. Filter ventilates the tank being filled and returns collected dust

weighs 28 lb per cubic foot and is handled at an average rate of 2 tons per hour.

Drums are unloaded by suction through a flexible hose and an unloading nozzle. Resin is drawn into the conveying line and lifted to the intake point of the receiver, which also serves as a storage bin. Suction is provided by a gear-type blower with the line connected to the suction side.

Carryover of air-entrained resin from the receiver is prevented by drawing the air through a bag-type filter on top of the bin. This arrangement cleans the air before it enters the blower, thus reducing blower maintenance.

Core Binder Handling—The third plant is a new automotive foundry in which eight different core binders are unloaded by a single pneumatic conveyor. These binders are handled at an average rate of 20 tons per hour from railroad car to 5900-cu-ft storage tanks in a system which is fully enclosed and self-cleaning.

Binders are received in railroad cars, sucked through a flexible hose to a receiver, and blown to storage. Selection of the proper storage tank is accomplished by a single hose connection, as shown in one of the accompanying illustrations. Dust in the bins is collected by a filter and returned to storage.

Officials of the plant report that the system is completely trouble-free. It operates with no dust in the plant, no contamination of materials, no moving parts to create safety hazards, and no servicing in the first year of operation. In addition, it has made possible lower labor and material costs. This plant estimates an annual saving of $32,000 in labor costs alone. Unloading by pneumatic conveyor is four times as fast as manual unloading.

The installations described in this article were made by Dracco Corp., Cleveland.

Distributes Kaiser Aluminum

Kaiser Aluminum & Chemical Sales Inc., Chicago, has appointed George Sall Metals Co., 2255 East Butler St., Philadelphia, as an ingot distributor. The Sall company's facilities include 75,000 sq ft of plant and warehouse space, eight furnaces, extensive mechanical handling equipment, and a fully equipped laboratory. George L. Sall is president and Leonard S. Malmud and Norman Sladkin are vice presidents.

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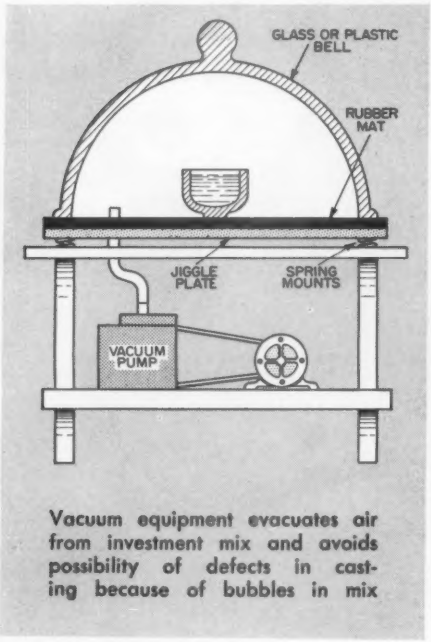
Trouble Shooting

By C. W. AMMEN



Vacuum equipment evacuates air from investment mix and avoids possibility of defects in casting because of bubbles in mix

Investment Casting Problems

Dear Charlie:

Recently we made several small investment molds to cast some little aluminum bronze parts which we felt could be made only by the lost-wax method. We tried several mixes, from dental plaster to equal parts plaster of paris and silica flour, and we rolled up some sheet metal flasks 4 in. in diam by 3 in. tall and attached the wax patterns to a wax sprue. So far, however, no luck. The big trouble seems to be bubbles in the investment. Do we have air pockets under our patterns?

Vibrating the flasks to eliminate bubbles only disrupted the patterns and left some bubbles on the underside of the patterns. Articles on the process are available, but all lack details about the little problems which throw us. Incidentally, what is cristobalite investment?

Sincerely,
Sam

Dear Sam:

Investment casting is like any other type in that with experience one develops little tricks of know-how and becomes more proficient.

The bubbles always are a problem when work is done with plaster or plaster investments. Dipping, flicking, vibrating, and vacuum seem to be the four methods used. The only surefire method is the vacuum process.

The dipping method consists simply of dipping patterns and sprue in a thin mix in such a manner as to eliminate bubbles and give the patterns a thin coat of investment. When this coat is dry, the sprue is mounted on a rubber sprue base, and the flask is put in position and filled with investment.

The vibrating method is self-explanatory and only so-so as to results.

Flicking is a hand method widely used by sculptors in lost-wax casting of art objects. Small amounts of investment are mixed in little copper or rubber bowls. The second and third fingertips are dipped into the investment and then withdrawn into the palm. From this position, the fingers are snapped out, flicking or throwing the plaster investment onto the wax model or pattern. Working is done from the bottom up until the piece is completely coated. After this coat is dry, the buildup is put on in the usual manner.

The vacuum method is widely used by jewelers and by producers of fine industrial castings. It not only is the best, but also is the simplest. Of course, it involves an investment in suitable vacuum equipment.

You also asked about cristobalite investment. Cristobalite is used as a refractory and differs from ordinary quartz only in the crystal structure. Cristobalite investments are recommended for use on all low-melting alloys such as brass, bronze, gold, and silver.

I would use a prepared cristobalite investment if I were you. Use 100 parts of the investment to 40 to 50 parts of water by weight, depending on material used and casting weight and size. Use a thin mix for light work and a thick mix for heavy or chunky work. The water should be at room temperature.

Weigh out the water and place it in a mixing bowl. Sift the powdered, preweighed investment into the water while mixing. When the mixture is creamy, place the mixing bowl under the bell jar of the vacuum pump and take out the air in the mix. While this is being done, place your flask (which should be stainless steel) in position. The sprue base should fit the flask tightly. Also allow sufficient pattern clearance between patterns and flask—$\frac{1}{4}$ to $\frac{3}{8}$ in. minimum on the side and $\frac{1}{2}$ to $\frac{3}{4}$ in. over the highest part of the pattern.

Pour the vacuumed investment very carefully into the flask, being careful not to disturb the patterns. Pour just enough to cover the patterns, then place flask and sprue base under the bell jar and vacuum the flask until all the air trapped under or around the patterns comes out. Then fill the remainder of the flask with investment.

Cristobalite investments should be

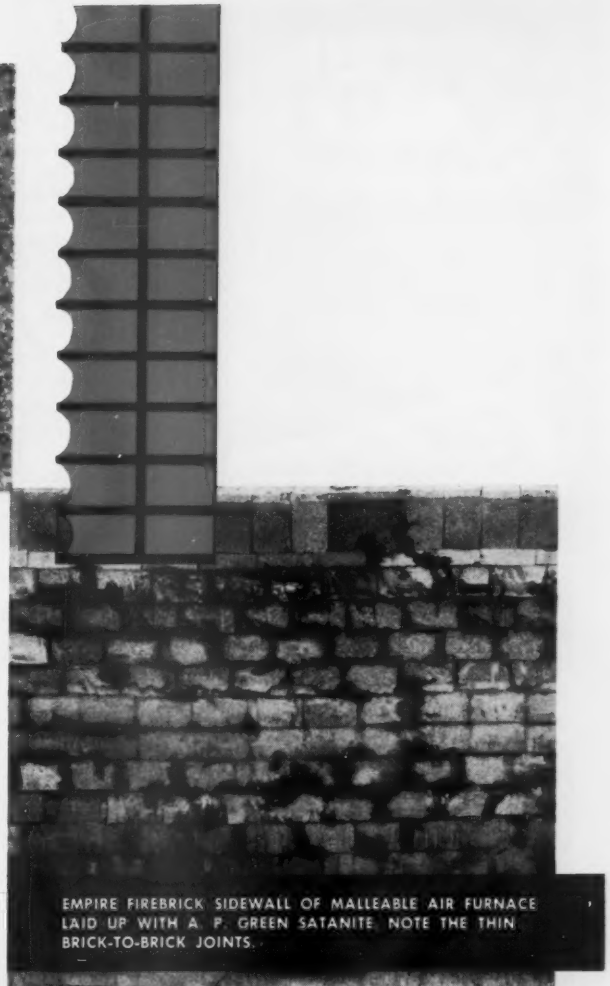
after 16 heats A. P. GREEN SATANITE joints protrude beyond the firebrick sidewalls

A large midwestern foundry reports excellent results from furnaces in which A. P. Green SATANITE slag resisting mortar was used in laying up the sidewalls. The photographs clearly tell the story. A sidewall is shown immediately following installation and after 16 heats.

Note that after 16 heats, although the firebrick attacked by flame, slag and molten metal, has worn back several inches, the SATANITE joints still protrude ⅛ to ¼ inch beyond the surface. This enables the wall to wear back evenly and give added joint protection. Protection that pays off in lower refractory cost, longer runs and increased production.

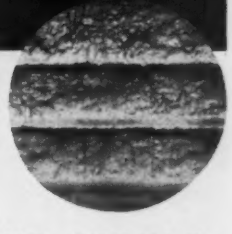
In malleable air furnaces where sidewalls and bottom are laid up with SATANITE, any part of them can be easily removed for patching or rebuilding. Use SATANITE bonding mortar to increase the life of the lining in all types of malleable iron air furnaces, ladles, electric furnaces, cupolas, and hot metal mixers. Packed in 100-pound multi-wall bags.

Look for the name of your nearby A. P. Green Distributor in the yellow pages of your telephone directory or write us for further information.



EMPIRE FIREBRICK SIDEWALL OF MALLEABLE AIR FURNACE LAID UP WITH A. P. GREEN SATANITE. NOTE THE THIN BRICK-TO-BRICK JOINTS.

SAME SIDEWALL AFTER 16 HEATS.



CLOSE-UP SHOWING SATANITE JOINTS PROTRUDING ⅛ to ¼" BEYOND SURFACE OF FIREBRICK.

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Circle 668 on Page 119

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air dried for about 1½ to 2 hours. One of the most important operations in making investment castings is in the proper firing of the mold. This step should be carried out on a well programmed basis, in accordance with the instructions supplied with the purchased investment.

Most cristobalite investments should be fired under 200° F for the first hour. Be sure the wax is out, then gradually increase the temperature to 1300° F. Take about 2 hours to reach 1300° F, hold at 1300° F for one hour, then drop down to the desired mold temperature on pouring which I would estimate at 800 to 1000° F for aluminum bronze. This temperature you will have to find out for yourself by experience.

Sincerely,
Charlie

Magnesium Association Plans Convention in Detroit

"Magnesium Looks Ahead" has been announced as the theme of the 14th annual convention of the Magnesium Association, to be held at the Fort Shelby Hotel, Detroit, Oct. 16-17.

The damping quality of magnesium, of major importance to the electronics industry, will be discussed. A survey of automotive uses of magnesium will be offered, and a number of papers will review its uses in planes, missiles, and rockets and general material handling.

Details of the program are available from Jerry Singleton, Magnesium Association, 122 East 42nd St., New York 17, N. Y.

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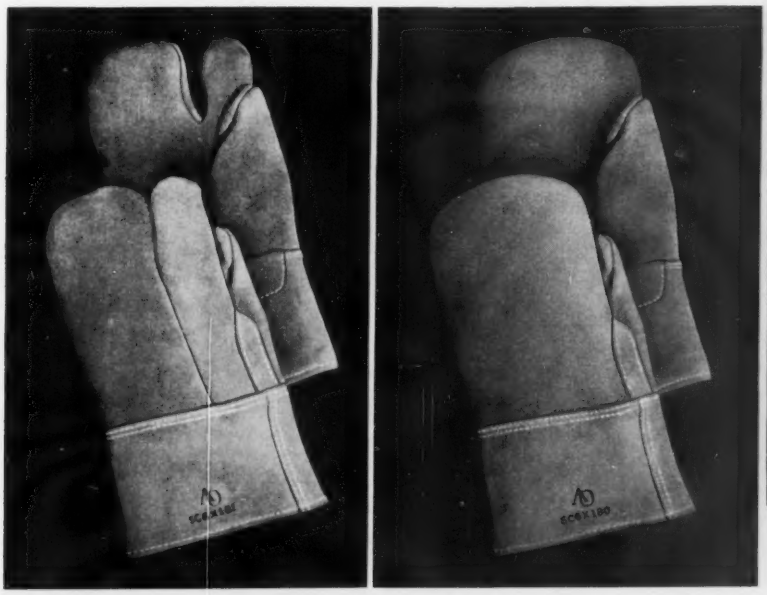
Leather or asbestos? American Optical makes both and perhaps can save you money by suggesting good quality AO leather gloves or mittens for operations where you may now be using asbestos.



AO one-fingered cowhide mittens or full mittens may save you additional money if finger dexterity is not needed. As against gloves, they have fewer vulnerable seams and are less expensive. If leather cuffs are not necessary, further savings are possible by using styles with lined duck cuffs. Reinforcing strap around thumb base. Lined cuffs. Bib patch at wrist.

- **SC6X151** — One-fingered mitten — 4″ leather cuff
- **SC6X151DC4** — One-fingered mitten — 4″ duck cuff
- **SC6X151DC2** — One-fingered mitten — 2″ duck cuff
- **SC6X180** — Full mitten — 4″ leather cuff
- **SC6X180DC4** — Full mitten — 4″ duck cuff
- **SC6X180DC2** — Full mitten — 2″ duck cuff

Recommended Operations — Heat treating, die casting, drop forging, block bending, steel mill coil tying, etc. Your nearest AO Safety Products Representative can supply you.

Always insist on AO Trademarked Safety Products

AO gloves of Specially Chrome Tanned Cowhide are heat resistant and selected for uniform thickness. A full heavy-weight liner throughout adds insulation — even cuffs are lined for extra protection. Clute pattern makes 'em comfortable. Reinforcing strap around base of thumb makes 'em stronger. Bib patch at wrist.

- **SC5X166** glove has 4″ leather cuff
- **SC5X166DC4** glove has 4″ duck cuff
- **SC5X166DC2** glove has 2″ duck cuff

American Optical Company makes a full line of *quality* protective hand protection for all industrial purposes — safety clothing, respirators, safety glasses and goggles, and specialties.

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SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

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Valuable metallics are being recovered quickly and economically from foundry sands, floor sweepings and machine shop wastes by the SuperDuty® Table.

This specialized machine separates metallics, even in minute particles after grinding, by floating the residues over riffle pools that capture the heavy values and discard the refuse with uncanny efficiency. For full information about how you, too, can make surprisingly profitable savings this economical way, send for Bulletin 118-B.

The original Deister company • *Inc.* 1906

The Deister Concentrator Company, Inc.

935 Glasgow Ave. • Fort Wayne, Ind., U. S. A.

Circle 672 on Page 119

Control Foundry Chilling with

CHILL KOOLHEAD NAILS

CHILL NAILS and SPIDERS

Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.

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Obituary

KENNETH C. BROWNELL, 55, chairman of the board of directors, American Smelting & Refining Co., New York, died Aug. 4. He joined the company in 1927, became vice president in 1936, president in 1949, and board chairman last year.

Milton T. Smith, 57, retired president, Marion Power Shovel Co., Marion, Ohio, and former vice president, Bucyrus-Erie Co., South Milwaukee, Wis., died recently. Mr. Smith was elected president and general manager of Marion Power Shovel Co. in 1956. He was vice president of Bucyrus-Erie Co. from 1950 until 1954.

William Tarr, 42, metallurgist, Midwest Foundry Co., Coldwater, Mich., died July 10. Associated with the company 12 years, he had worked in such other capacities as cupola operator and laboratory technician.

George H. Jewell, 76, who retired recently as vice president, Glamorgan Pipe & Foundry Co., Lynchburg, Va., with offices in Chicago, died July 15.

James R. Fergusson, 75, president, J. R. Fergusson Co. Ltd., Dundas, Ont., Canada, died July 7. He established the foundry company 20 years ago.

W. Benton Keller, 76, president, North Lebanon Foundry Corp., with offices in Philadelphia and plant in Lebanon, Pa., died July 22. He had been president of the foundry since 1920.

Theodore V. Wood, vice president and general manager, Florence Pipe Foundry & Machine Co., Florence, N. J., and R. D. Wood Co., Philadelphia, died July 2.

Howard E. Shelton, 73, for many years associated with the former Shelton Foundry, Paducah, Ky., died July 7.

Herbert C. Geittman Jr., sales representative, Climax Molybdenum Co., division of American Metal Climax Inc., New York, died re-

WEDRON

A COMPLETE LINE OF 24 DIFFERENT PROCESSED SILICA SANDS

A CONTROLLED GRADE FOR EVERY CASTING NEED!

SAND SPECIFICATIONS — REPRESENTATIVE SCREEN ANALYSES

Unground Sand	4098	4085	4060	4040	4030	4020	5040	5030	5025
Ret on 20 Mesh	2.2								
Thru 20 ret on 30	38.6	12.4	5.6	0.6	0.4	0.4			
Thru 30 ret on 40	57.6	70.8	56.2	37.2	30.2	21.2	4.0	1.2	0.6
Thru 40 ret on 50	1.4	16.3	34.8	52.0	55.8	51.4	34.8	30.4	23.8
Thru 50 ret on 70	0.2	0.5	2.8	9.0	11.4	20.6	44.4	48.2	42.0
Thru 70 ret on 100			0.6	1.0	1.8	5.2	14.4	17.8	26.4
Thru 100 ret on 140				0.2	0.4	1.0	2.0	2.0	6.2
Thru 140 ret on 200						0.2	0.4	0.4	0.8
Thru 200 ret on 270									0.2
Grain Fineness (AFS)	25.88	30.49	33.72	37.48	38.82	42.22	49.96	51.64	56.90

Unground Sand	5015	5010	5005	7030	7020	7010	C-30	C-10
Ret on 20 Mesh								
Thru 20 ret on 30								
Thru 30 ret on 40	1.2	0.4	0.2	0.2	0.2			
Thru 40 ret on 50	15.2	11.2	4.4	3.0	2.4	0.4		
Thru 50 ret on 70	40.2	35.2	31.2	26.2	18.0	8.2	0.4	0.2
Thru 70 ret on 100	35.4	37.4	41.2	42.0	45.0	46.6	28.4	8.4
Thru 100 ret on 140	6.4	10.8	15.4	16.4	20.0	23.2	44.8	50.2
Thru 140 ret on 200	1.2	4.0	5.6	9.6	11.0	15.4	18.8	28.2
Thru 200 ret on 270	0.4	0.8	1.4	1.8	2.4	4.2	5.0	8.8
Thru 270 ret on 325		0.2	0.6	0.8	1.0	2.0	2.6	4.2
Grain Fineness (AFS)	60.20	66.92	73.92	79.36	84.42	95.44	108.22	124.60

Ground Sand (Flour)	80M	100M	140M	200M	300M	325M	400M
Ret on 60 Mesh	10/20%						
Thru 60 ret on 100	25/30%	5%					
Thru 100 ret on 140	15/20%	14%	4%	1%			
Thru 140 ret on 200	10/15%	16%	6%	4%	2%	Trace	
Thru 200 mesh	25/40%						
Thru 200 ret on 270		10%	12%	6%	2%	0.5%	Trace
Thru 270 ret on 325		12%	8%	9%	11%	4.5%	2%
Thru 325 mesh		43%	70%	80%	85%	95.0%	98%

99.9% PURE SILICA WEDRON SILICA COMPANY INDUSTRIAL SAND

FINE SHELL MOLDING SANDS
STANDARD CASTING SANDS — BLASTING SANDS
SILICA FLOUR — LIGHT METAL CASTING GRADES

Wedron offers you a complete line up of casting sands — anything needed for every *casting* need! This means you get the advantages of one source of supply for all the sand you need — sand of the highest quality, too.

Now this Wedron quality stems from two factors. First is the naturally rounded grain sand of the Ottawa-Wedron district (this is held to be one of the purest silica sand deposits in the nation). Second is the modern, completely equipped Wedron plant, which turns out a superior silica product and makes all grades available.

Look to Wedron for the *complete* line of quality casting sands.

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WEDRON SILICA COMPANY

135 SOUTH LASALLE STREET, CHICAGO 3, ILLINOIS

Circle 674 on Page 119

The door to higher quality, longer wear and greater economy in abrasives . . .

ABRASIVE SHOT & GRIT CO., INC.

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Circle 675 on Page 119

cently. Prior to joining the company in 1955, Mr. Geittman was associated with Richmond Foundry & Mfg. Co., Richmond, Va.

Grover C. Johnson, 68, owner of the East Texas Foundry & Machine Co., Marshall, Tex., died July 11, in Houston. Mr. Johnson had operated the company since he founded it 35 years ago.

R. C. Van Hellen, 57, traffic coordinator, Unitcast Corp., Toledo, Ohio, died July 16. In 1926 he joined Industrial Steel Castings Co., which was incorporated into Unitcast Corp. in 1937. Mr. Van Hellen was production manager and traffic co-ordinator for over 30 years. He served as secretary-treasurer of the Toledo Chapter of the AFS for more than ten years.

Edmund D. Brack Sr., 74, consultant, Ajax Metal Div., H. Kramer & Co., Philadelphia, died July 30. Mr. Brack was associated with Ajax Metal for more than 50 years, and worked in all phases of foundry operation.

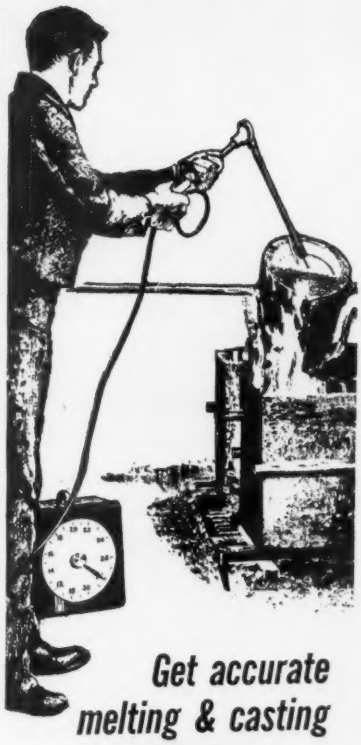
Accident Prevention Handbook Issued by Safety Council

The National Safety Council, 425 North Michigan Ave., Chicago 11, has published the second edition of its *Handbook of Accident Prevention*. The 93-page handbook on occupational safety contains such new material as a description of radioactive hazards and ways to protect against them. It is written for small businesses lacking full-time safety specialists. Style of the handbook makes it effective for use by key personnel in small organizations.

Book Review

ASTM Standards on Light Metals and Alloys, 1957, paper, 310 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $3.75.

This compilation of ASTM specifications and methods of tests for light metals and alloys supersedes the 1955 edition. It contains 51 standards, of which 36 are new or revised or have had their status otherwise changed recently. Topics covered include ingots; castings; bars, rods, wire, shapes; forgings; pipes, tubes; sheet, plate; wrought products, filler metal; and electroplating.



Get accurate melting & casting temperatures . . . IN SECONDS!

Now, in 10 seconds or less, you can get precise molten metal temperature measurements in induction furnaces, pot furnaces, ladles, risers, test spoons, runner boxes, troughs, lab furnaces . . . anywhere in the shop.

The operator simply dips the platinum tip of the L&N Portable Thermocouple—protected by its expendable, low-cost quartz sheath — into the molten metal. In seconds, he sees true temperature boldly indicated on the 23-inch circular scale of the portable, a-c operated Speedomax H potentiometer indicator.

Simple to use, economical to maintain, this equipment has been enthusiastically received in hundreds of foundries and melt shops. It's available as a complete "package"—with an indicator range of 1000 to 3000 F, or 2000 to 3200 F, as specified—ready for immediate use.

A call to your nearby L&N Field Office will bring full information . . . or write for Data Sheet N-33A-681(3) to Leeds & Northrup Company, 4917 Stenton Avenue, Philadelphia 44, Pa.

LEEDS & NORTHRUP
Instruments — Automatic Controls • Furnaces

Circle 676 on Page 119

MANHATTAN *Reinforced* CUT-OFF WHEELS are Safer!

Engineered *built-in* reinforcement enables a cut-off wheel to take the abuse and excessive strain of heavy cutting in foundry operations. Every Manhattan Reinforced Cut-Off Wheel is reinforced *two* ways, to assure double safe operation on the job. Special fibers in the bond increase the wheel's strength to withstand destruction from centrifugal force by 50%. In addition, special industrial super-strength synthetic reinforcement resists side-strain far beyond the endurance of conventional cut-off wheels. The result? Actual field reports show up to 25% increase in cutting efficiency and cleaning room production . . . on both stationary and swing-frame cut-off machines. At the same time, Manhattan cut-off wheels offer a high degree of safety and protection against breakage.

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Ask your Manhattan sales engineer to show you how to get faster, safer cutting and increased production efficiency . . . "More Use per Dollar" . . . with Manhattan Reinforced Cut-Off Wheels and other types of Manhattan high speed, heavy duty wheels.

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RM-841

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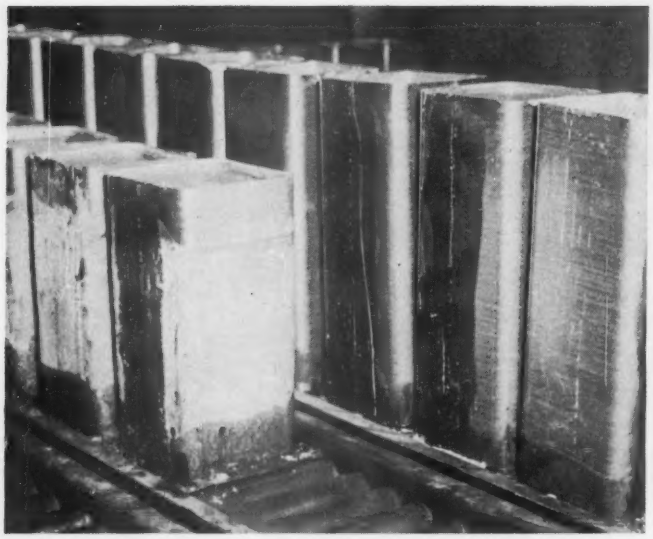
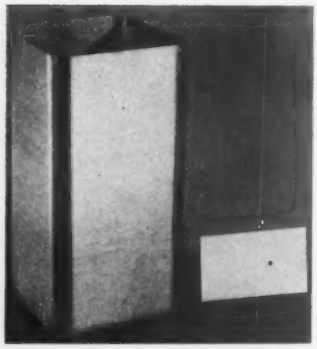
Circle 677 on Page 119



Flasks have been filled with investment matrix. Those in foreground are coated with phosphoric acid solution

Top of disposable flask contains gel and excess investment. High-speed masonry saw cuts it off

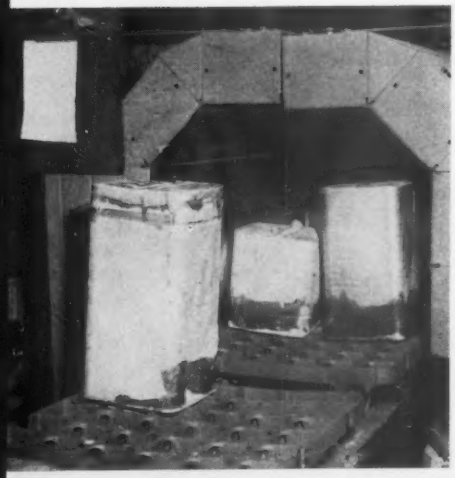


Disposable flask as fabricated. Type 1 aluminized steel is used

Aluminum-Coated Steel Flasks

. . . *Are Expendable*

By W. E. McFEE
Armco Steel Corp.
Middletown, Ohio



After filling and sawing operations, flasks enter wax melting furnace at 1800° F temperature

DISPOSABLE aluminum - coated steel flasks have solved an investment casting production problem at the Materials Mfg. Dept., Westinghouse Electric Corp., Blairsville, Pa.

The department formerly used a high-nickel alloy for investment casting flasks. These cans or flasks were used over and over again, but had to be straightened after each cast. Although castings coud be removed from the molds without destroying the flasks, it was a difficult job and often resulted in time-consuming repairs before re-use.

After experimenting with flasks made of aluminized steel, the department adopted them. More than 50 tons of the aluminum-coated steel now are used annually for the investment casting flasks.

Whereas one man formerly could remove only 60 casts in a day, he now can remove from 140 to 200. The aluminum-coated steel flasks are used only once and are destroyed in the removal process. The cans are stitched together with stainless steel wire, and removal is relatively easy. The seam is broken open with a ball peen hammer in about 4 minutes, and the investment is knocked away from the metal.

The investment matrix used in the Westinghouse process forms a semisolid gel at the top of the cell. When the high-nickel alloy cells were used, a paper extension was placed on top of the can for the gel to form in. Once the matrix had set up, the paper extension was cut off, thereby removing gel and excess investment from the remainder of the mold.

Now, because the aluminized steel flask is used only once, the flask is made with enough volume that the top portion, with the semisolid gelatin, is removed simply by sawing through can and matrix with a high-speed masonry saw.

The new method saves time in preparing molds for casting and also is much cleaner. The paper extensions formerly used frequently broke

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Circle 678 on Page 119

A COMPLETE LINE OF
ROLLER CONVEYERS
engineered and standardized by

MATHEWS

Roller conveyer pouring lines served by two roller conveyer transfer cars in modern mechanized foundry.

The Mathews line of roller conveyer is complete, with rollers ranging from 1-⅜" to 6-½" in diameter, and with capacities from 60 lbs. to 13,000 lbs. High quality ball bearings are used throughout.

Accessories such as turntables, hinges and switches are available from stock.

A full line of couplings and supports makes the installation of Mathews Roller Conveyer lines convenient and easy.

For latest information write for CATALOG 156

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CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS
(Member Foundry Equipment Manufacturers Association)

and allowed the gelatin to run out. Another advantage of sawing the top off is that it provides a better surface for the flask to rest on when it is turned upside down for charging.

Some of the flasks are treated with a phosphoric acid solution before hot metal is poured into molds. The solution forms a coating that eliminates certain gaseous reactions

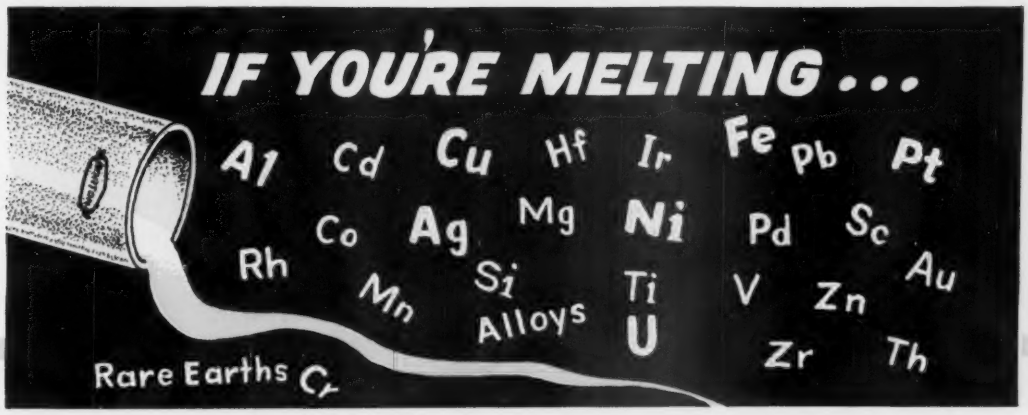
View of flasks after they have left the wax melting furnace

between mold cell and cast alloys. The flask simply is dipped in the phosphoric acid solution.

Molds are charged to a continuous, tunnel-type furnace where the mold temperature is gradually increased from room temperature to 1800° F. The molds are subjected to the oxidizing atmosphere for approximately 24 hours.

Parts produced by the Westinghouse process generally conform to standard investment cast tolerances of ±0.003 in. per inch.

"It's got a real he-man scent called 'Foundry Fumes'"



Norton crucibles, available in many materials, meet a wide range of needs

HEAVY WALL CRUCIBLES

Furnace Sizes in Pounds	Outside Diameters	Wall Thicknesses	Over-All Heights
½ to 300	1⅛" to 12¼"	⅛" to ⅝"	3½" to 16½"

Materials Available

ALUNDUM*	"A" 99% Alumina	All Sizes Shown	**ZIRCONIA**	"H" Fused Stabilized Zirconia	All Sizes Shown
CRYSTOLON*	"G" First Quality Silicon Carbide	All Sizes Shown	**THORIA**		½ to 50 lbs.
CRYSTOLON	"N" Nitride Bonded Silicon Carbide	All Sizes Shown	**URANIA**		½ to 50 lbs.
MAGNORITE*	"K" 97% Fused Magnesia	All Sizes Shown			

LIGHT WALL CRUCIBLES

Furnace Sizes in Pounds	Outside Diameters	Wall Thicknesses	Over-All Heights
½ to 50	1 3/32" to 5 13/16"	3/32" to 5/32"	3½" to 10 11/16"

Materials Available

ALUNDUM	"A" 99% Alumina	½ to 50 lbs.	**ZIRCONIA**	"H" Fused Stabilized Zirconia	½ to 50 lbs.
MAGNORITE	"M" 99% Fused Magnesia	½ to 50 lbs.	**THORIA**		½ to 17 lbs.

Norton crucibles are *engineered and prescribed* for a long list of metal melting operations. Available in a wide range of materials, sizes and types — as shown in the tables — they provide long, trouble-free service, protect your product purity and meet specific melting requirements.

Norton heavy wall crucibles, exceptionally strong and dense, are used for most induction furnace melting jobs. Thin wall crucibles, generally of lower porosity, are particularly suited for special and nuclear metallurgical processes. Their fine, smooth surface is particularly valuable for protecting high purity metals from refractory inclusions.

It will pay you to get further facts on this complete line of crucibles. For exact recommendations and all necessary details, contact your Norton Representative. Or write for new catalog, *"Norton Refractory Crucibles,"* to NORTON COMPANY, 308 New Bond Street, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

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REFRACTORIES
Engineered . . . Rx . . . Prescribed

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Around the Country

NEWS REPORTS FROM

Chicago . . . Pittsburgh . . . Boston . . . Philadelphia

Boston— With an initial capacity of over 14 million pounds, the new Walworth Co. foundry, New England's most modern nonferrous shop, will be pouring brass and bronze castings at Braintree, Mass., by October. It is an induction melting plant with five furnaces, and will handle both shell and green sand molding.

Gray iron shops in New England are estimating more tonnage, and indications are that fourth quarter will be the best of the year. Iron casting capacity will not be filled, but operations may reach 20-25 points above the 50 per cent melt prevalent through the first half. Improvement in demand from the machine tool industry is slow, but low inventories of finished castings by most industries is reflected in a moderate increase in business.

Supplies of raw material, including pig iron and scrap, are ample with prices steady except for some firming in cupola cast scrap.

Until demand for finished castings more closely approximates capacity, prices are likely to be the weak factor. Foundries also have become more quality - minded, prodded by consumers; this is one reason the ratio of scrap in melts has not increased substantially. Foundries are holding scrap purchases to strict specifications.

Although backlogs are lower, brass and bronze shops are operating at a higher rate than gray iron foundries and in a few cases are well up to capacity. Business in valves, pressure pipe fittings, and shipyard requirements has held up relatively well.

Philadelphia— With the summer vacation season nearing an end, foundry operators anticipate a more appreciable gain in operations over the next several weeks. As expected, August showed only a small gain over July, which was the slowest month so far this year.

"Gus!"

Currently, gray iron foundry operations average around four days a week, but with restricted working forces. Improvement in machine tool orders has not worked back to the foundry level and, except for automotive die work, there has been little gain in any line. Most job shops can promise deliveries within two weeks. Steel castings business also is lagging, reflecting in particular light inquiry from builders of industrial equipment. Deliveries on plain steel castings can be had in two to three weeks and on alloy and special treatment tonnage in four to five weeks.

Hardware and pipe fittings requirements are sustaining malleable operations at some plants at around four to five days a week. In general, malleable business appears to be holding at a relatively higher rate than the other ferrous lines.

In brass and bronze there is a good demand for industrial pumps and certain types of ship work. Those engaged in casting ship propellors are quite busy, with some having enough work on hand, it is said, to last two years. Meter business and plumbing supply requirements are holding fairly well. Some captive shops in these lines are farming out specifications to jobbers.

The Newark, N. J., Foundry Division of M. H. Detrick Co. has been closed.

Chicago— Foundries in this area are encouraged by indications of improved business activity during the remainder of the year. Declining orders for castings during the first eight months of 1958, continuing the downward trend line of last year, have forced the majority of shops to operate short weeks. A moderate increase in bookings would restore normal work schedules for many.

Most favorable factor at the moment is the prospect that automotive foundries will be busy for the next four months producing engine and other castings for 1959 model cars. Sales of 1958 cars were a bitter disappointment. Observers look for moderately improved sales for

CARRIER CONVEYS
REALLY HOT MATERIALS

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- **Heavy Conveying Troughs** — ½" thick and heavier. Widths to 6', lengths to 500'. Easily vibrated in 1" stroke by rugged coil springs and single patented Carrier Natural-Frequency Drive.
- **Expandable Trough Sections** — Each 5' trough section attached by spring-loaded bolts through slotted holes. Sections expand independently of each other and of conveyor's structural members.
- **No Leakage** — A continuous one-piece dribble trough (not shown) mounted several inches below the conveying trough collects any fines which may leak through the conveying trough sections.
- **Replaceable Trough Sections** — New conveying trough sections easily installed. Little delay. Convenient replacement principle cuts costly down-time.
- **Heat-Resistant Materials** — Alloy and stainless steels resist warping and high-temperature scaling. Low abrasive wear due to gentle conveying action.
- **Quenching or Cooling** — Can be accomplished by direct or indirect water spray, plate-coil deck, or air.
- **Heat-Protected Drive** — Heat protection provided by heat shield, dribble trough, and flexibility of location.

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the new models and think that better fortune for cars will pace the whole economy.

Farm equipment production this year is running 5 to 10 per cent ahead of 1957. Since the industry is pretty well concentrated in the Midwest, gray and malleable iron foundry suppliers have been more active than in several years. Farmers are in good financial condition and are spending to modernize their facilities, and machinery makers have gone all out in the introduction of new tractors and attachments which improve farming efficiency.

Following a setback in the early part of 1958, sales of road building machinery are showing good improvement. This means better activity for steel and malleable foundries. Building construction, particularly residential, has revived and has increased requirements for builders' hardware and plumbing goods.

Bolstering optimism for better business generally in the closing months this year is the fact that steel production is rising. In recent weeks the Chicago district ingot rate has been going up at close to two percentage points a week. No predictions are made that business improvement will be sharp—rather it is likely to be moderate and steady.

Foundries have a lot of lost ground to make up, but it appears that a favorable course is charted and that the wind and current are in the right direction.

Pittsburgh— "Things are looking up," foundrymen agree, but few are jubilant about immediate prospects.

Pessimists say business looks good only because it's being contrasted with July's dismal activity. It's only natural that orders should improve when buvers return from vacation, they argue.

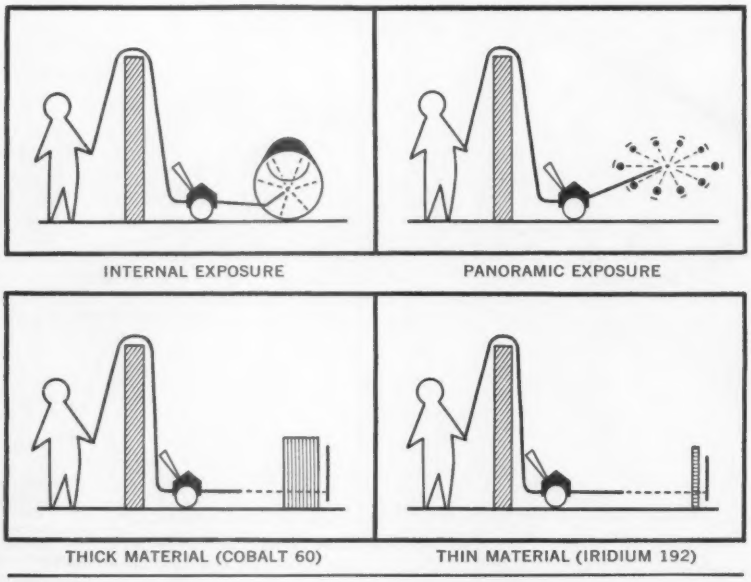
Optimists attribute the pickup to better steelmaking operations. "The mills are getting more confident," a foundryman explains. "They're looking into their files and dusting off old plans. They've decided to go ahead with some of the small projects that were shelved when the recession deepened."

Although orders are coming in at a faster rate, foundries haven't accumulated any backlogs. Most of the gray iron shops are working three or four days a week. One firm reports that its sales to industrial furnace makers and manufacturers of bottling machinery are "holding up pretty well." Even so, it hasn't been able to recall any of the workers (one-third of its labor force) who've been laid off since the first of the year.

Price cutting remains a problem for most foundries, but it's more of a help than a hindrance to one of the big, low-cost operators. "We've been working five days a week since May," its sales manager reports. "Last week our tonnage was the same as it was a year ago. We're getting business from all of our customers except the steelmakers. Demand from the construction (cement) industry is the strongest right now."

Nonferrous foundries are faring better than the steel and gray iron shops. For the last three weeks, a bronze foundry has been operating at 70 per cent of capacity. Steelmakers have increased their purchases of rolling mill bearings and bushings, it reports.

In general, the facts seem to add up to an improved situation with the promise of more improvement.



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Nuclear Systems' Model 52 Multitron gamma radiography machine offers this time and labor saving combination for a wide variety of quality inspection.

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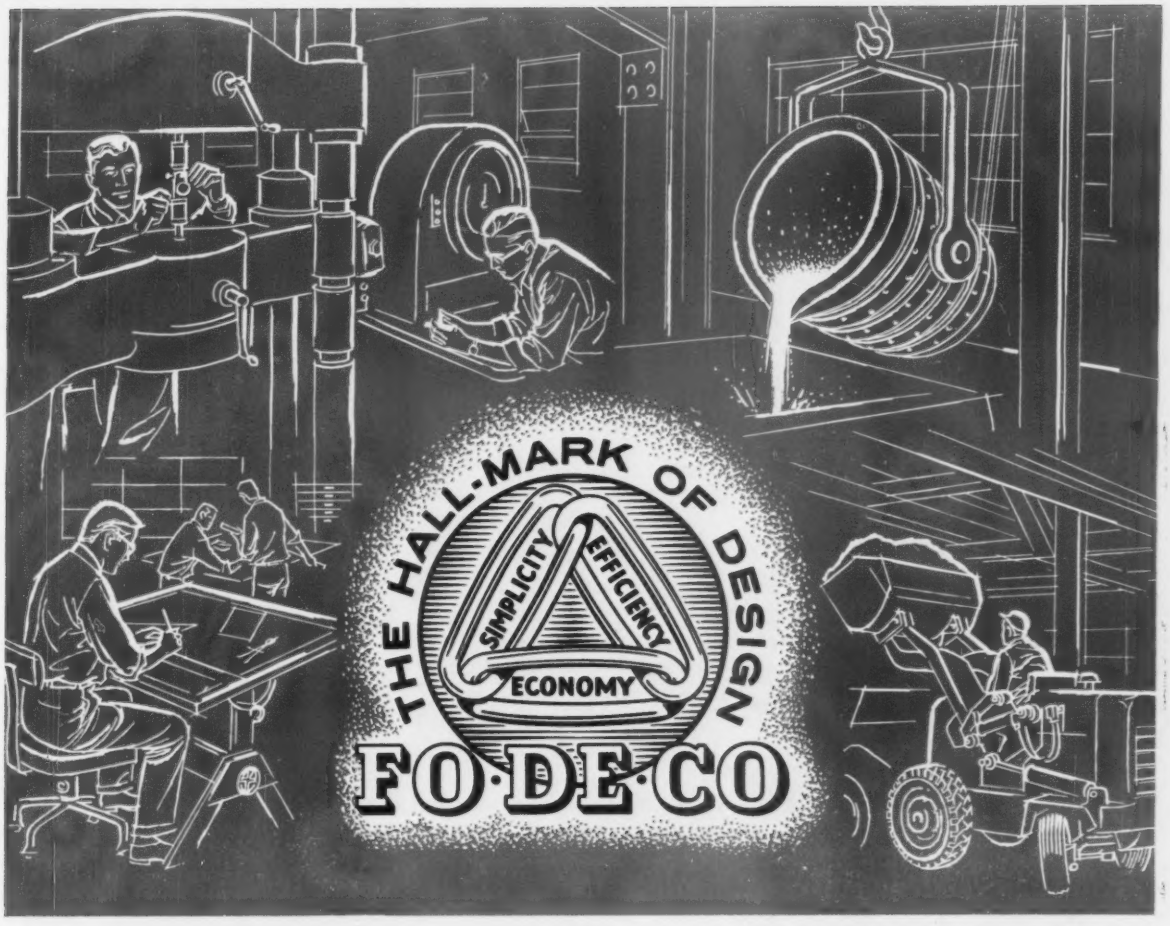

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Circle 683 on Page 119

THE DESIGN OF STEEL CASTINGS

New Edition Is Published in English

A Practical Guide to the Design of Steel Castings, 52 pages, 8 x 10 in., paperbound, published by the British Steel Castings Research Association. For sale through the Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. Price $3.

This work originally was prepared by the Commission Technique de la Metallurgie des Aciers of the Centre Technique des Industries de la Fonderie, Paris, France. The present edition, in English, was prepared by the British Steel Castings Research Association with the co-operation of the British Steel Founders' Association.

The book deals with steel castings from the standpoints of soundness, economy in production, and good engineering design. Sections cover properties of cast steel, foundry defects attributable to bad casting design, design rules independent of direction of molding and pouring, and design rules involving molding and pouring.

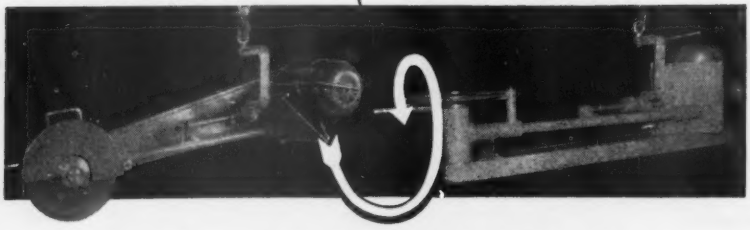
An up-to-date study of the problems of steel casting design, it is illustrated by 120 working diagrams. Object of the publication is to provide designers with the essential rules to follow to insure economical production of sound castings. It should be of value to designers, draftsmen, engineers, and all others concerned with the specification, design, and production of cast steel components.

FOX

SWING FRAME

CUT-OFF MACHINE

FOR FAST REMOVAL OF SPRUES AND RISERS FROM BRONZE, ALUMINUM AND IRON CASTINGS!



FULL MANEUVERABILITY THROUGH 180°

The new Fox Swing Frame Cut-Off Machines have been designed to take advantage of the new type "flexible" cut-off wheels. The machine has full maneuverability through 180°. It is especially recommended for the removal of sprues and risers from bronze, aluminum and iron castings.

Available in two sizes, 16" and 20". Write for Catalog!

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OLIVER BUILDING PITTSBURGH 22, PA.

Dayton Malleable Publishes "Castings Answer Book"

Dayton Malleable Iron Co., Dept. P, P. O. Box 980, Dayton 1, Ohio, has announced a reference for metals parts manufacturers interested in product improvement and lower manufacturing cost. "Metal Castings Answer Book" points out in question-and-answer form advantages and uses of malleable iron, pearlitic malleable iron, gray iron, aluminum, and magnesium, and it describes many typical applications. The book includes description and pictures of casting operations in the company's foundries in Ohio, New York, and Wisconsin.

Revises Engineering Curriculum

Milwaukee School of Engineering, 1025 North Milwaukee St., Milwaukee, has revised its mechanical engineering curriculum to meet the increasing manpower needs of industry and government. Technical institute courses in air conditioning, industrial, and metallurgical technology are 18-month courses which lead to the associate in Applied Science degree. MSOE also offers a 36-month course leading to the Bachelor of Science degree.

Under the revised curriculum, all mechanical engineering students now begin their academic work with a nine-month mechanical technology program from which they proceed into their areas of specialization.

In addition, students may elect to attend classes on a nine-month academic year basis or on a continuous, twelve-month basis until they have completed requirements for the technician or engineering degree.

Speed production of grey iron castings

EXCELLENT FLOWABILITY of Dexocor binder sand mix gives uniform structure throughout cores—and draws are made easily without sticking.

A large midwestern grey iron foundry finds that:

*"Cores made with Dexocor baked through in 40 to 50 per cent less time—saving fuel dollars and permitting more flexible production scheduling. In addition, green cores, even with high stands or overhang, held perfect shape. Cracking of cores, gas defects and metal penetration were virtually eliminated."

—Dexocor offers other advantages: Better moisture control, excellent flowability, quick, easy mixing, blowing, ramming, easy shake-out—especially when used with Mogul or Kordek binder.

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Circle 685 on Page 119

Logan Conveyors serve all phases of production in the modern foundry. Here, Roller Conveyor lines facilitate movement of molds away from molding stations, through pouring and cooling zones, then on to shake-out. Handling economy is obvious.

SALES begin in the SHOP

GROWING competition for sales has produced among other benefits, an all-out effort to curb waste. Waste, whether measured in materials, labor, time or space, is a luxury that today's business can ill afford. Losses in these areas often can be reduced or even eliminated by more efficient materials handling—with a favorable effect on price and sales volume.

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Courts Rule Patentee Must Be First Inventor

Supreme Court Ruling Is Embodied in Patent Law

By Albert W. Gray

BEFORE the Patent Office Board of Appeals for review a short time ago was an application for a patent of a device for obtaining a thrust augmentation in a turbojet airplane engine—for burning fuel in the tailpipe section, thus supplementing the main burner head of the turbine. This application was rejected by the patent examiner for lack of invention.

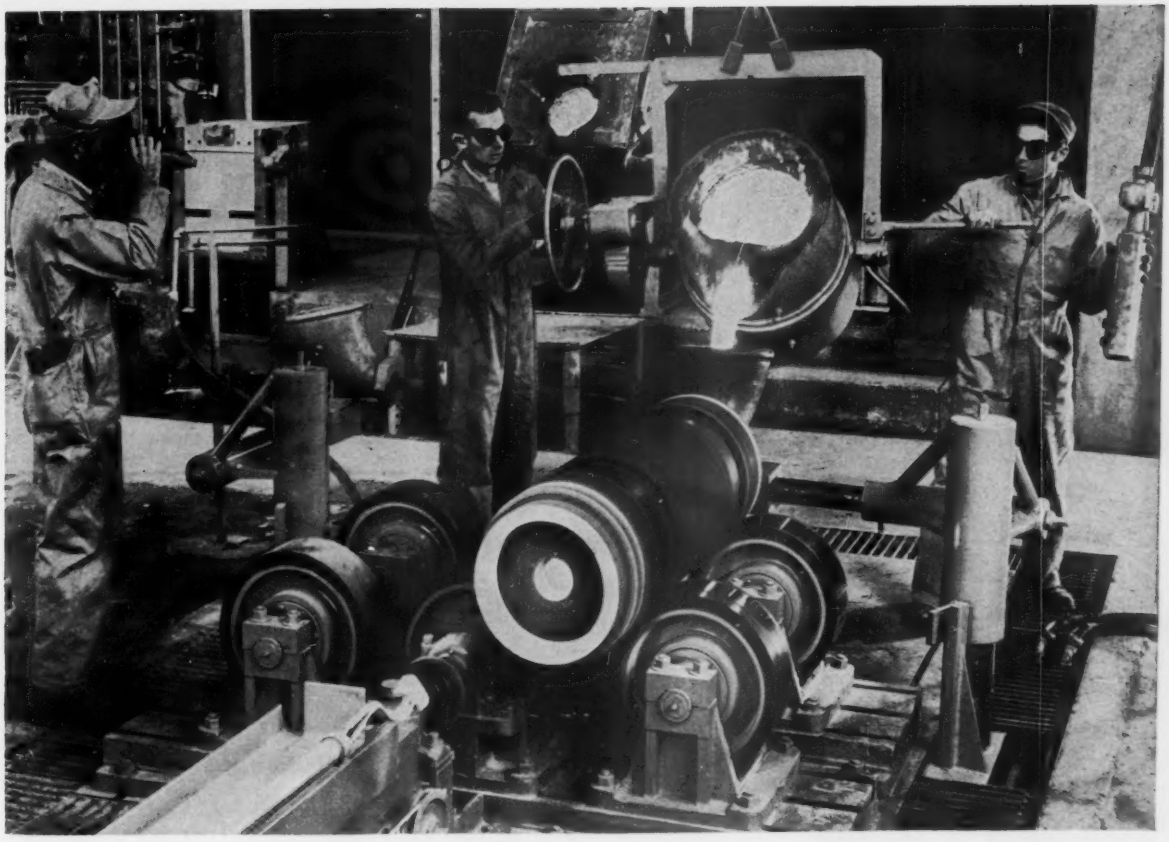
Grounds for this rejection were two prior patent applications which taken in conjunction covered the same discovery. These disclosures, the Board of Appeals held, were conclusive of a prior knowledge inconsistent with the claim of this applicant that he was the first inventor.

This same feature of the patent law was before the United States Court of Appeals a few years earlier in a suit for infringement brought by a manufacturer of oil well drilling bits. In the defense in this infringement suit, the alleged infringer contended that the patents on which this action was based were invalid because the patentee had not been the first inventor.

There the court said of the principle applied in both of these instances, "The rule to be applied in a contest between two or more rival inventors whose applications for patent are pending at the same time, is that the one who first conceives the invention and exerts reasonable diligence in perfecting it and reducing it to practice, is the first inventor."

When the patent law as amended in 1952, a new clause was added: "A person shall be entitled to a patent unless . . . the invention was described in a patent granted on an application for a patent by another, filed in the United States before the invention thereof by the applicant for the patent."

This represented the enactment into the statute of a rule of law laid down by the Supreme Court of the United States over 25 years before. When the art of employing oxy-acetylene torches for the cutting and welding of metals was discovered, application was made for a patent on the device itself, but



WHY GOOD CENTRIFUGAL CASTING DEMANDS INDUCTION MELTING

Though centrifugal casting has values apart from any melting furnace used, it achieves its ultimate performance only with induction melted metals. You may have wondered yourself why the vast majority of critical centrifugal castings are poured from Ajax-Northrup induction furnaces. The reasons are many—

Take purity for example. One major advantage of centrifugal casting is that the spinning concentrates impurities such as dirt, slag particles, even gas, at the internal skin, where they can be machined away easily. Obviously, the purer the melt, the thinner the skin to be machined. And Ajax-Northrup induction melting has proved itself many times over to be the purest melting method known!

Or take uniformity. The electromagnetic stirring action inherent in the Ajax-Northrup induction furnace assures absolute uniformity of chemical composition and temperature throughout the melt, resulting in consistently homogeneous castings, even with alloys containing metals of widely varying densities such as Al, Ni, and Mo. In fact, users have been able to eliminate uniformity tests on Ajax melted centrifugal castings entirely.

The precise metal temperature control available with Ajax-Northrup induction equipment is another important consideration in the production of consistently uniform castings. Hot and cold pours are eliminated. And this combination of ideal temperature control and perfect mixing adds up to good, reproducible results.

Ajax-Northrup induction melting equipment, with its unique control system offers you maximum melting efficiency with resulting lower melting costs. The new compact designs incorporate many features which minimize floor space requirements, drastically reduce installation costs, minimize maintenance, and provide simple, more efficient operation.

Induction heating & melting

AJAX

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Whether you're centrifugal casting tiny investment castings, massive rolls, or critical jet engine tail sections, you're sure to find an Ajax furnace that satisfies your needs perfectly. We'll gladly send you further information, or, if you wish, arrange a meeting with qualified furnace engineers to discuss your special requirements. Ajax Electrothermic Corporation, Ajax Park, Trenton 5, New Jersey.

ASSOCIATED COMPANIES: AJAX ELECTRIC COMPANY-AJAX ENGINEERING CORPORATION

Circle 687 on Page 119

through an oversight no claim was made to the discovery of the process.

"The patent," said the court when this patentee sued for the infringement of his process, "is not for a process but for a mechanical device and the patentee merely shows how it is possible to use the tools in the ways of the prior art."

In its decision that by this inventor's omission from the claims in the patent application of the process itself and that by his merely setting out claims to the mechanical feature of the torch, the inventor was not protected in his discovery of the process, the federal court said this:

"The question is therefore squarely presented whether on the issue of prior invention it is the claims or the disclosure which counts. That question is unfortunately left in much confusion in the cases. On principle it would seem that the claims were the place to look for the 'invention.' The claims alone give the scope to the invention and some scope is essential to its value. It would seem that the 'invention' must lie in the act of selecting out of the possible combinations which will read upon the disclosure, such as are new and useful."

When a few months later this decision was affirmed by the federal appellate court the comment was made on this situation, "We hold that a 'first inventor' within the meaning of that phrase as used in the statute, must be a person who perfects his invention. No invention can be intellectually perfected unless it is thought out and concluded and the only evidence of such perfected invention ordinarily derivable from any patent is a union of disclosure and claim. Evidence of disclosure only (all we have here) is not enough and before publication disclosure alone does not evidence anticipation."

By these decisions the inventor, in brief, having failed to include in his claims the oxyacetylene process of the blowpipe, even though that process was implicit in his claims for patent protection on the torch, had released his discovery to the unrestricted use and enjoyment of the public.

Two years later when the appeal from these decisions was reversed by the Supreme Court of the United States, Justice Holmes, holding the inventor here entitled to patent protection on the process as well as the torch, tersely stated this rule that a quarter of a century later was to be enacted as a part of the patent law itself.

"The fundamental rule, we repeat, is that the patentee must be the first inventor."

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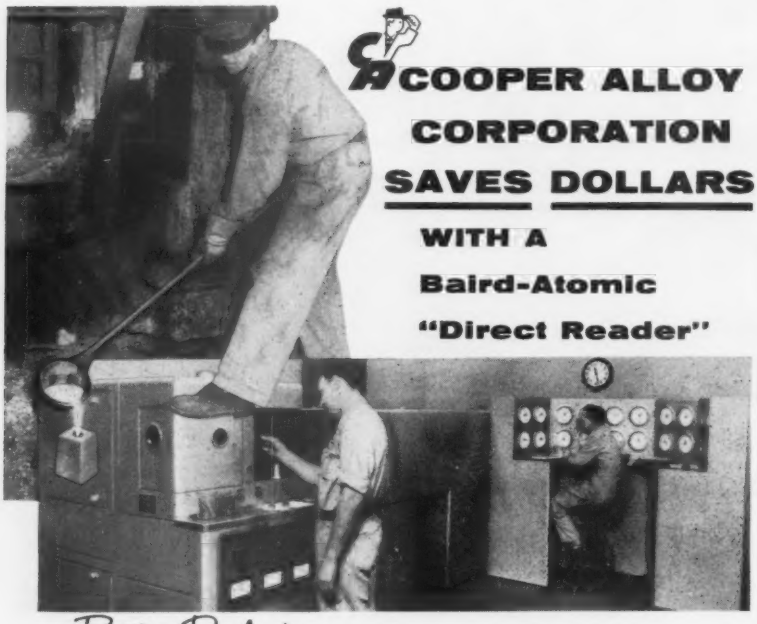
Alexander Milburn Co. v. Davis-Bournonville Co., 270 U. S. 390, March 8, 1926

Small Business Administration Bulletin Covers Cost Control

Designed to help small firms in exploring the subject of cost control, a pamphlet has been announced by the Small Business Administration. Entitled "Cost Control Pointers for Small Marketers," the pamphlet is No. 34 in the SBA series which is called *Small Marketers Aids.*

Edited by Glenn A. Welsch, professor of accounting, College of Business Administration, University of Texas, Austin, Tex., the bulletin describes development of cost



COOPER ALLOY CORPORATION SAVES DOLLARS WITH A Baird-Atomic "Direct Reader"

Better Product:

Increases control of "heat" composition
Better quality control of castings for Cooper customers

Faster Operation:

Only *8 minutes* laboratory time required to test two samples and report results to foundry
Rapid determination of scrap composition prior to use
Detection of "tramp" elements
Faster production

Savings in Cost:

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Saving of molds if heat isn't right and can't be corrected
90% of costly laboratory overtime eliminated
25% over-all cost reduction over previous "wet chemistry" analysis methods

If your foundry should operate better, faster or at lower costs, complete information on the B-A Direct Reader is available to you from:

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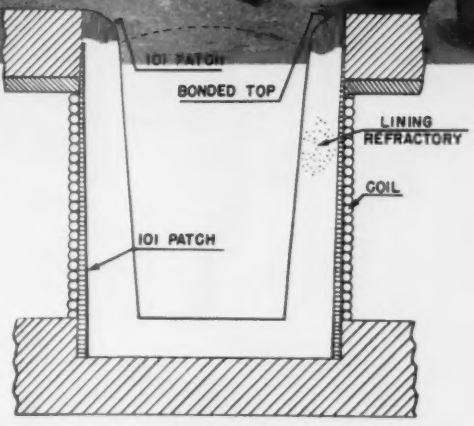
Cooper Alloy Corporation, producer of stainless steel custom castings, valves and fittings, installed a Baird-Atomic Direct Reading Spectrometer in its laboratory in 1956 to replace chemical analysis. The Direct Reader rapidly analyzes production heats of 30 different alloys, also purchased scrap, barstock for valves, and scrap pig. Over 468,000 determinations have been run at Cooper Alloy to date. The verified results on foundry operation are listed at the left.

Baird Atomic

USE

TASIL NO. 101 PATCH



for high frequency induction furnaces

TASIL (Taylor Sillimanite) No. 101 Patch is widely used by operators of high frequency induction furnaces for coating of the inner surface of the water-cooled, primary coil. When air dried, this coating will:

1. **Protect the coil when the crucible is being rammed in place.**
2. **Protect the coil from damage in the event of a leakage of metal through the lining proper.**

Properties which qualify TASIL No. 101 Patch for this service are: *high di-electric strength . . . smooth working properties . . . softening point above 3200° F. . . . negligible shrinkage or expansion . . . can be used with either an acid or basic lining.*

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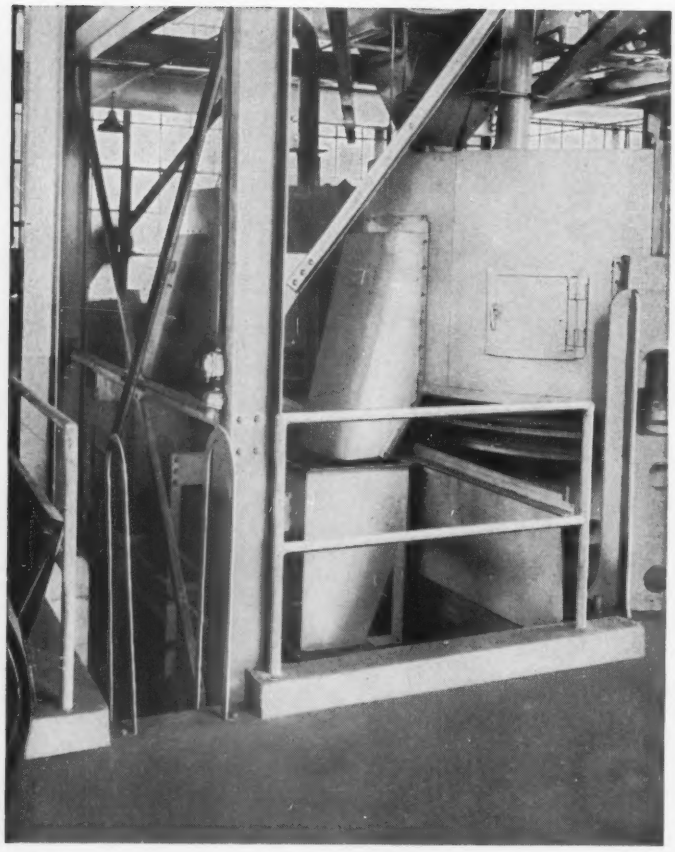
Circle 689 on Page 119

THE *Clearfield* MIXER



Write today for Catalog No. 83. See what we mean by "A Clearfield Mixer for every need!"

gives *consistent uniformity* in your sand

Automatic time controls on the Clearfield Mixer permit the use of a predetermined, uniform procedure without depending on the human element. This gives you precise control over length of tempering, quantity of bond, and all other factors—you don't have to mix sand by your operator's "instinct". The result is consistent uniformity . . . the Clearfield way. These controls may be added to any Clearfield Mixer.

CLEARFIELD MIXER mixes, tempers, aerates

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Circle 690 on Page 119

THE Short Cut TO LOW Scrap Losses

When consideration is given to the number of casting defects directly traceable to faulty sand practice, it becomes apparent that proper sand control is the short cut to low scrap losses.

The Gordon-Campbell sand testing units offer the latest improvements for checking these critical properties of sand mixtures: clay content, permeability, bond strength, moisture, core hardness, and core strength. The tests are quick, and no calculations are required. They offer the simplest approach to sand control.

Write for full particulars on Gordon-Campbell sand control units. Savings in scrap losses will pay for the program.

RAMMER-COMPRESSION TESTER—This simple unit combines ramming of specimens for permeability tests and making bond strength tests. Strength values are read on large dial.

PERMTESTER Permeability values for molding and core sand mixtures are shown on dial in a few minutes.

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Circle 691 on Page 119

consciousness, accounting and record keeping, planning, estimating costs, and development of a budget to break down daily costs. Free copies can be obtained from the Government Printing Office, Washington 25, and SBA field offices.

Book Review

Industrial Hygiene and Toxicology, edited by Frank A. Patty, 807 pages, published by Interscience Publishers Inc., New York. Price $17.50.

Information on industrial hygiene and toxicology is presented in simple, understandable terms in sufficient detail to be of some use to all persons interested in safeguarding the health and welfare of working people and in improving the working environment. Several references are offered for readers who want to pursue the subjects in greater detail.

Major changes in this revision of a book first published in 1948 cover subjects of noise, heat, ionizing radiation, human engineering and industrial safety, sanitation, air pollution, and illumination.

Mr. Patty is director of industrial hygiene for General Motors Corp. Contributing editors include 15 well-known industrial hygiene authorities from government, industry, and educational institutions.

* * *

Constitution of Binary Alloys, by Max Hansen and Kurt P. Anderko, 1305 pages, published by McGraw-Hill Book Co., 330 West 42nd St., New York 36. Price $32.50.

This reference book, a revision and translation of a German work by Max Hansen, managing director, Metallgesellschaft A. G., Frankfurt-Main, Germany, and Kurt P. Anderko, research metallurgist, Armour Research Foundation of Illinois Institute of Technology, Chicago, has been prepared under sponsorship of the U. S. Air Force through the Wright Air Development Center.

It provides a source of reliable data concerning the constitution of binary alloy systems (phase diagrams) and the crystal structure of metallic phases. About 9600 literature references are included as well as 1286 systems and 684 diagrams. Diagrams in the present edition are presented in atomic per cent rather than weight per cent. Included in the book are the conversion factors and tables necessary for the interconversion of atomic and weight per cent.

Simplify foundry use of refractories and SAVE with multi-purpose IRONTON BERLITE

ONE REFRACTORY does 7 jobs to SIMPLIFY your foundry routine. Add the necessary water to **Ironton BERLITE** and put it to work 7 ways:

RAMMED LINING for bull, mixing ladles.
MUD LINING for hand and bull ladles.
RAMMING MIX for tap & slag holes, spouts.
MORTAR for brick-lined ladles.
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PATCHING MATERIAL for all ladles.
WASH COATING for ladles & cupola spouts.

SAVE ON LONGER SERVICE

Slag and metal do not stick to **Ironton BERLITE** . . . so linings are not destroyed in cleaning ladles. **MORE REFRACTORY** than any fire clay brick, **Ironton BERLITE** does not melt or slag out. Since **BERLITE** meets every refractory need, your inventory and delivery worries are over. You'll eliminate refractory repairs, too. **BERLITE** is stored dry; you should never have any waste. Day-to-day service tests prove these facts.

We will send you enough **Ironton BERLITE** to test in your shop under your conditions. We ask only that you pay the freight. If you need help, Ironton engineers are always available to work with your men and show them exactly how to use **BERLITE.** Write or phone us **today.**

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Reliable Refractories

Write for name of nearest representative, or telephone Ironton 109

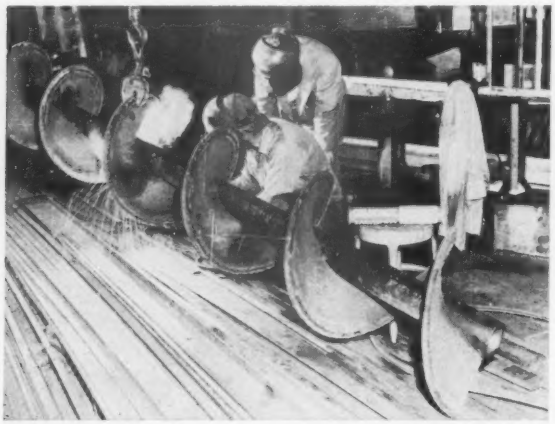
Circle 692 on Page 119

The Shakeout

Hard Facing Cuts Sand Screw Replacement Costs

REDUCTION of up to 94 per cent in replacement costs of sand mixing screws has been achieved by an eastern foundry using a combination of Colmonoy No. 1 and WCR-100 hard-facing materials to protect flight faces and periphery.

Two hoppers feed two different sands into the head end of the screw, which acts as a mixing device while



conveying the sand to its discharge end, where it is deposited on a belt conveyor. The belt carries the sand into a bin.

Screws formerly lasted one month before excessive wear made replacement necessary. With hard facing, they consistently last six months or more. The hard facing now is standard practice for new screws as well as for rebuilding. In addition to providing longer life, the facing costs only 40 per cent of the price of a new screw. Downtime also is reduced.

For More Details Circle No. 518—Page 169

New Lubricant Cuts Maintenance Costs

A CHANGE in the type of lubricant used on core-car wheel bearings has resulted in labor savings of nearly two 40-hr weeks annually at C. H. Milles

Foundry Co., Chicago. Replacement costs of bearings and other affected parts also have been reduced with the new lubricant.

Two core cars handle output of the Milles core department. These cars, one with roller bearings and the other with steel axles and gray iron bearings, are loaded with approximately 2½ tons of cores and plates and wheeled into the oven for average stays of 5 hours. Temperatures range as high as 420° F and average 400° F.

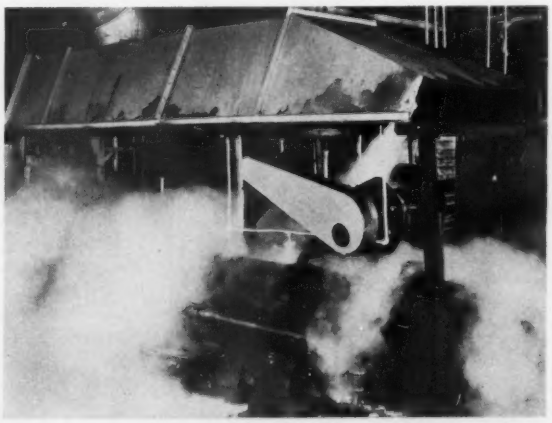
With the old method of lubrication, monthly teardowns were required to free frozen bearings and remove heat-polymerized grease. Three years ago Milles switched to a new lubricant which has reduced frequency of cleaning to once every 10 months. It consists of 1 gal of Oildag, a dispersion of colloidal graphite in petroleum oil manufactured by Acheson Colloids Co., Port Huron, Mich., with 30 gal of No. 30 Famous Pale oil, a product of Famous Lubricants Inc., Chicago. The mixture is applied daily with a liquid Zerk gun through Zerk fittings on the bearings.

For More Details Circle No. 519—Page 169

CO_2 Systems Fight Quench Tank Fires

AUTOMATIC carbon dioxide systems provide the most efficient round-the-clock protection against flash fires in oil-filled quench tanks, according to Walter Kidde & Co., Belleville, N. J. Quench tank fires rank high on the list of causes of industrial fires.

When flame appears, rate-of-temperature-rise fire



detectors or fixed temperature thermostats in the system trigger cylinders of CO_2, as shown here. Pressurized gas floods from the containers and passes to the tank, where it is discharged from nozzles across the surface of flaming oil, and the fire is snuffed out in seconds. The cooling action of the dry ice gas also tends to lower oil temperature, minimizing possibility of a reflash.

Carbon dioxide is a nonconductor of electricity, and it cannot damage equipment or contaminate liquids. It eventually dissipates into the atmosphere and leaves no mess to clean up.

For More Details Circle No. 520—Page 169

COLUMBIA-SOUTHERN

SODA BRIQUETTES® for faster, better desulphurizing

The size and shape of Columbia-Southern Soda Briquettes have been scientifically designed to do a faster, better desulphurizing job in Blast Furnace and Foundry operations.

The walnut form exposes maximum surface area and it is a known fact that such maximum contact is a highly important factor in determining the percentage of sulphur reduction.

Aside from speedy and efficient desulphurization, Columbia-Southern Soda Briquettes accelerate production, increase fluidity, quicken the release of gases and impurities, allow for automatic slag skimming, and improve the refining value of the iron.

Order your supply today by name "Columbia-Southern Soda Briquettes." Packed in 100 lb. paper bags; easy to handle and store.

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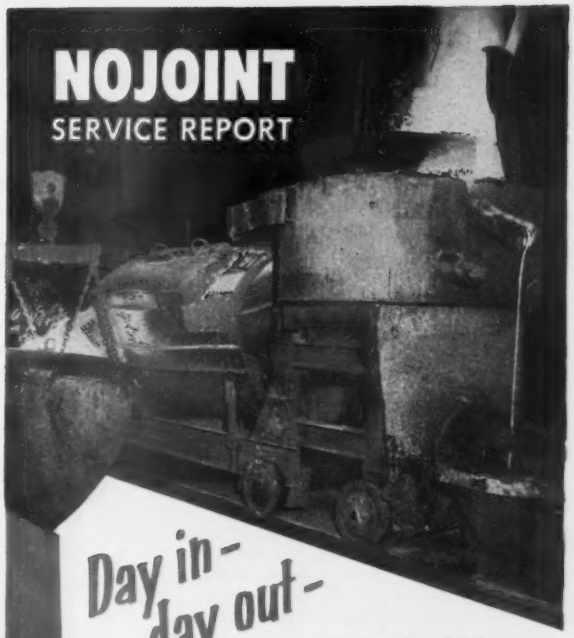
IN CANADA: Standard Chemical Limited

Circle 693 on Page 119



Day in-day out-at 2800°...

resisting metal and slags

IN A HOLDING LADLE of 12,000 lbs. capacity, operating continuously at Glamorgan Pipe and Foundry Co. in Lynchburg, Virginia, the lining is **Ironton NOJOINT.** An average of 230 tons of metal at 2600°-2800° goes through the U-shaped ladle daily. At that heat, and on that schedule, a refractory really gets a chance to prove its dependability.

J. H. Sale, Chief Metallurgist, says **Ironton NOJOINT** is the best refractory for the purpose when all factors are considered. The **NOJOINT** lining stands up against metal and slags for 10 weeks. Maintenance costs are low, too (the lining was spot-patched only once in 50 working days). Installation is easy, goes fast with an air rammer because **NOJOINT** is shipped with carefully controlled moisture content.

A fully detailed report on **Ironton NOJOINT** performance at Glamorgan Pipe and Foundry Co. is available. Write today for your copy.

NOJOINT STORED 2 YEARS STAYS MOIST, READY TO USE

NOJOINT is available dry in bags, and moist in cartons or drums. The 550 lb. drum is a true economy under today's conditions. **NOJOINT** will keep as long as two years in the drum with lug-closing lid. We tell you how to get it out quickly, easily. Order a 550 today and save money on the quantity, save freight costs on repeated small shipments.

Since 1917
RELIABLE REFRACTORIES
THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

Write for name of the nearest Ironton representative, or Telephone Ironton 109

Circle 694 on Page 119

Worn cast iron paper stock pump

...repaired with Ni-Rod "55" electrode

...goes right back on the job

New "lease on life" for iron castings with Ni-Rod "55" electrode

When workers at Austell Box Board Corp. in Georgia pulled this cast iron slurry pump for inspection, they found the inner shell (above left) chewed up by abrasion, with finger-size cracks and gouges.

Scrap it? Not on your life. Down at Austell, they *repair* iron castings. Do it easily with Ni-Rod "55"* electrode.

First, surfaces are thoroughly cleaned. Then cracks and worn areas are filled with Ni-Rod "55". Use of metal arc process enables the welder to operate in close quarters without difficulty.

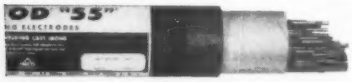
No pre-heat or post heat is needed. Slag chips off easily after each pass. In a short time the pump's back on the job.

The International Nickel Company, Inc.

Helpful booklet answers many welding questions

"A Handy Guide to Welding Cast Irons" illustrates the many different repair jobs you can do with Ni-Rod "55". It also covers technical data and gives helpful welding tips. For your copy, just write Inco. *Registered trademark

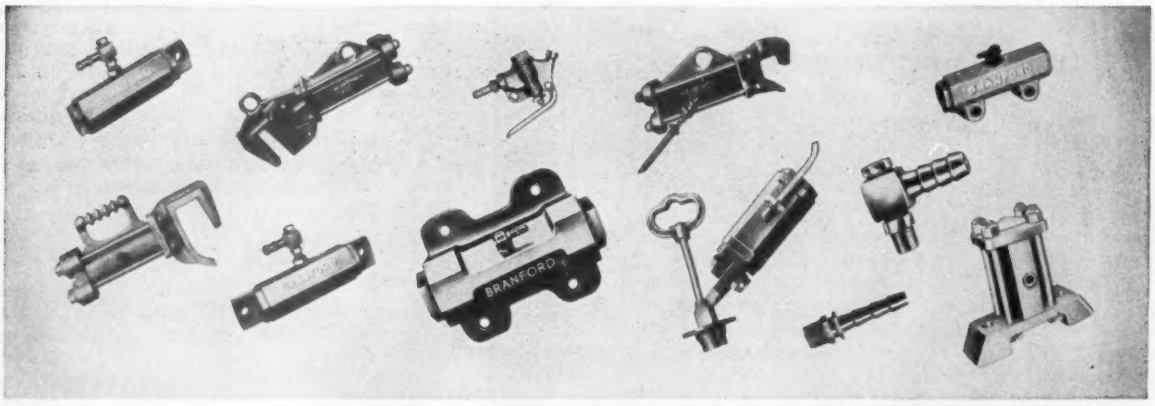
INCO 67 Wall Street, New York 5, N. Y.



INCO WELDING PRODUCTS

ELECTRODES • WIRES • FLUXES

Circle 695 on Page 119



VIBRATORS every size for every application

Branford alone makes the complete pneumatic vibrator line. In every size, for every application and use, there is a Branford Vibrator built to do your job better.

Rigid quality requirements . . . high grade, special steel alloys . . . immediate delivery through your own nearby distributors all make Branford your outstanding source for outstanding vibrator products.

Branford makes a complete line of pneumatic vibrator accessories too. Write today for your free Branford catalog and the name of your local Branford distributor.

1916 BRANFORD VIBRATORS U. S. A.

THE BRANFORD COMPANY 130 CHESTNUT STREET — NEW HAVEN, CONNECTICUT

Circle 696 on Page 119

For speed and convenience

MOROC®

the controlled silicate CO_2 binder

A GRADE FOR EVERY FOUNDRY REQUIREMENT

MOROC ❶ High-strength binder for ferrous and nonferrous molds and ladle linings.

MOROC ❷ For medium-sized and large molds and cores. Has high-strength and good collapsibility.

MOROC ❸ High-strength, high-collapsibility binder for ferrous and nonferrous cores, can be used in core blowing equipment.

MOROC ❹ Binder with extra-high collapsibility, especially well-suited for core blowing equipment.

Available in tank cars, tank trucks, 55-gal. drums, 5-gal. cans.

MOROC CORE PASTE—For joining sections of silicate bonded cores. Fast drying, gives a high-strength bond in minimum time. Supplied in 55-gal. drums, 5-gal. pails.

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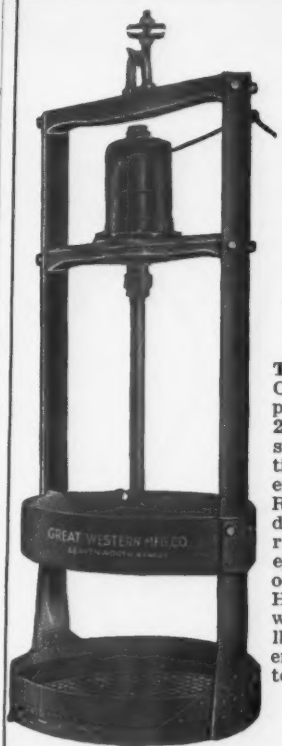
Diamond Alkali Company, Cleveland 14, Ohio

Diamond Chemicals

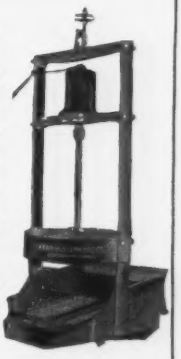
Circle 697 on Page 119



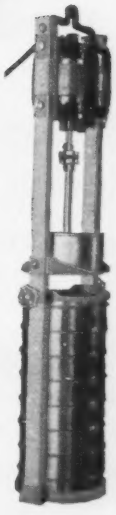
NO JOB TOO TOUGH for COMBS GYRATORY RIDDLES

"The Greatest Name in Motion"

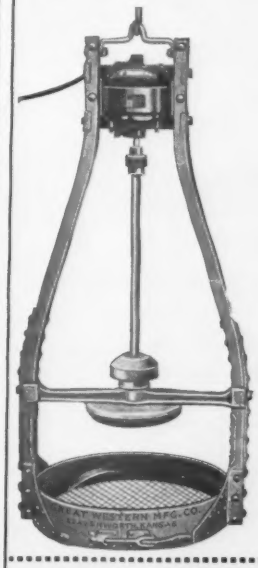
TYPE "CS". Complete price $395.00. 24″ square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4′10″, weight 295 lbs., ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $385.00. 24″ dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4′6″, weight 250 lbs., ⅓ H.P. enclosed motor.



TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.



PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20″ Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20″ dia. sieve with special clamp for 5-second changes. Height 4′6″, weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36″ sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas Phone MU-22291
☐ Send Additional FREE Information
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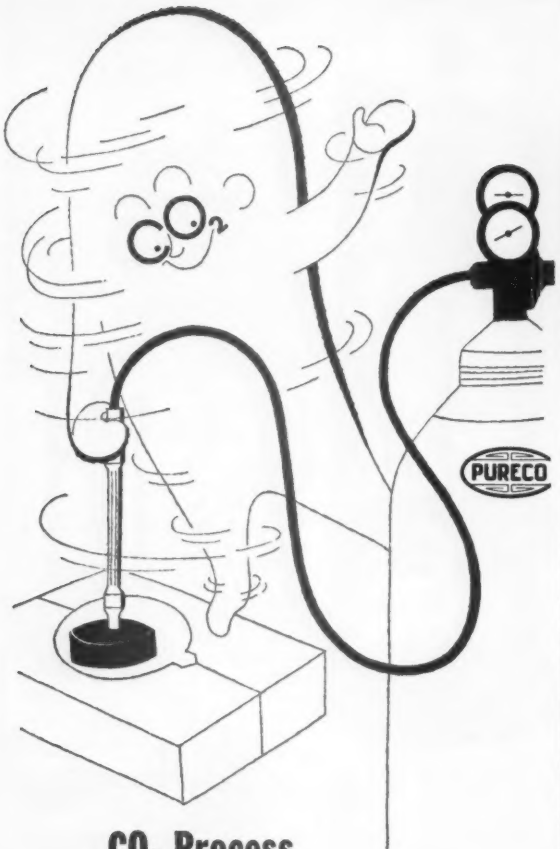
CITY STATE

Circle 698 on Page 119



CO_2 Process cures molds and cores in seconds—without baking

Pureco can tailor a CO_2 installation to meet your specific foundry requirements–whether they be large or small.

Call your nearest Pureco office for information regarding a complete line of CO_2 equipment and CO_2 supply systems–cylinders, cylinder banks, converters, receivers–all described in Bulletin #27. Write for your copy.

Remember–Pureco Technical Sales Service is anxious to serve you.

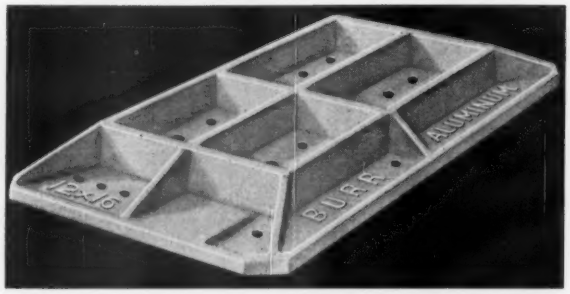
PURECO CO_2

Pure Carbonic Company

A Division of Air Reduction Company, Incorporated
150 EAST 42nd STREET, NEW YORK 17, N. Y.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

BURR ALUMINUM BOTTOM BOARDS IMPROVE CASTING QUALITY



STURDIEST POSSIBLE MOLD FOUNDATION

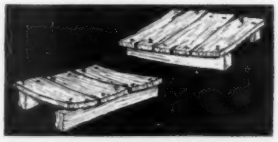
- Can't Warp, Swell, Twist, Burn or Come Apart
- Eliminates Cracked Molds—reduces rejects
- Strong—Rigidly Bridged—Lightweight—One Piece

Better castings are produced on Burr Aluminum Bottom Boards with fewer rejects caused by cracked molds, swells and inadequate venting.

240 STOCK SIZES assures QUICK DELIVERY

Write Today for prices and samples

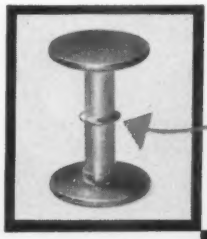
KILL THESE WRECKERS OF QUALITY



BURR ALUMINUM PRODUCTS

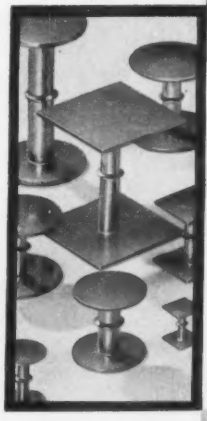
P.O. BOX 61 BURR OAK, MICHIGAN

Circle 700 on Page 119



it's the fin that stops leakage

Buffalo LEEK-PRUF-CHAPLETS



Castings of uniform density are assured with "Buffalo" *Leek-Pruf* Chaplets. Exclusive fin design of both Double and Single head types prevents leakage and assures positive fusion with molten metal. There is no recess in the stem to weaken the structure. Thoroughly coated to insure instant fusion. "Buffalo" Chaplets burn in more easily without chilling.

A wide variety of other types is also available to meet your specific molding needs exactly. For complete information, request Catalog No. 20.

Trial samples of any chaplets furnished without charge.

Combined Manufactured by
SUPPLY & EQUIPMENT CO., INC.
211 CHANDLER ST., BUFFALO 7, N. Y.

Circle 699 on Page 119

Circle 701 on Page 119

Blaw-Knox "Shark Tooth" buckets with liner plates for handling both sand and coke

You can cut both your coke and sand handling costs with a dual purpose Blaw-Knox "Shark Tooth" Foundry Bucket.

With liner plates attached you can handle granular fines. Remove the liner plates and the "shark teeth" handle coke with a minimum of degradation.

Your Blaw-Knox Bucket Engineer will be glad to give you full details of this single line hook-on bucket that serves a dual purpose. Call him today.

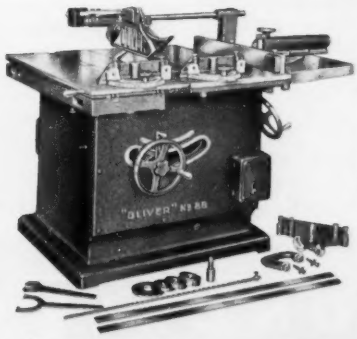
WRITE TODAY! Full details of Blaw-Knox single line hook-on type buckets are contained in Bulletin 2232-R.

BLAW-KNOX COMPANY
Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania

BLAW-KNOX

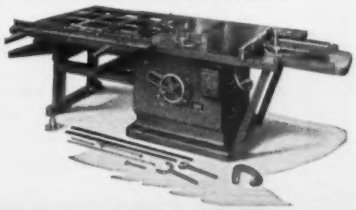
Circle 702 on Page 119

Saw those large sections of patterns with ease on this OLIVER



The large table permits the operator to rip, cross-cut, miter or dado with accuracy on the large table. Saw arbor tilts to any angle up to 45°. An 18-inch saw projects 4¾" through table having 4¼" vertical movement. Rips up to 50"; cross-cuts 48" x 1" thick. Has most accurate set of graduated gauges. Write for Bulletin No. 88-D.

- Also made in 6 additional models with a variety of table extensions to handle extra large work.



- **Write for details!**

OLIVER SINCE 1890

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

Circle 703 on Page 119

Master Power

HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS

because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

IF YOUR PROBLEM INCLUDES

chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

THE MASTER PNEUMATIC TOOL COMPANY, INC.
ORWELL, OHIO • U. S. A.
SALES • SERVICE • STOCK • COAST TO COAST

Circle 704 on Page 119

CUT YOUR COSTS AND SAVE YOUR PATTERNS WITH ARROW BUTTS AND PEINS . . . .

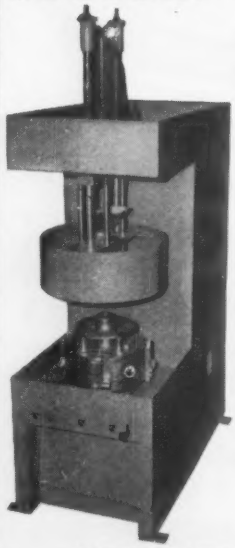
Featuring replaceable rubber tips. Over one half million have been used with complete satisfaction. Illustrated top left: Floor Rammer Butt, 3" dia. Top right: Bench Rammer Butt, 2⅜" dia. Bottom right: Bench Rammer Pein, ¾" thick x 2⅜" wide. Bottom left: Floor Rammer Pein, 1" thick x 2⅞" wide. Send for catalog on complete line of butts and peins. We feature 13 types.

Sand Rammer Butts are our business, not our side line

ARROW BUTT COMPANY
4800 W. 139th STREET, CLEVELAND 35, OHIO

Circle 705 on Page 119

CENTRIFUGAL CASTING MACHINES . . . WITH STANDARD PARTS AND EQUIPMENT CAN BE . . . CUSTOM BUILT



We make machines capable of producing castings weighing MANY TONS as well as machines to produce castings weighing a FEW OUNCES.

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Some machines are designed for long-run repetitive production, while other special machines are most suitable for short runs of varying sizes and types of castings.

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WE FURNISH INFORMATION ON HOW TO MAKE CENTRIFUGAL CASTINGS

INQUIRIES INVITED

INVESTIGATE THE POSSIBILITIES OF MAKING YOUR CASTINGS CENTRIFUGALLY . . . TODAY.

CENTRIFUGAL CASTING MACHINE CO.
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 706 on Page 119

A coating of DURA-STIX will work wonders!

Save the cost of lumber and labor to replace bottom boards. Prevent burning and scorching. Follow the practice of many of our Foundry Customers - Use **DURA-STIX** which pays dividends.

Write for free literature.

DURA-STIX

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THE METALLURGY OF STEEL CASTINGS
By Charles W. Briggs
625 pages, 334 illus. Price $11.00 Postpaid

A comprehensive work giving detailed data on the chemistry, metallurgy and technology of steel castings. Provides complete information on methods of technical and industrial control in production of steel castings and describes every manufacturing process used.

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Circle 708 on Page 119

NCP makes effective PATTERN LACQUERS

1. Seals pattern to prevent moisture and water absorption.
2. Brushes easily—dries quickly.
3. Does not chip, peel, bubble, or blister, and is flexible.
4. Adds slip, promoting clean parting of pattern from sand.
5. Made in all colors.
6. Time tested material—successfully used in pattern shops all over the country for over 30 years.

The National Chemical & Plastics Co.
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Circle 709 on Page 119

FOUNDRY

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LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MODERNIZATION

Circle 710 on Page 119

No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

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MURPHY PISTOL SPRAYER

Forces blackening into pores and pockets of molds. Sprays Silica wash, oil, or water equally well. Use it also to sand blast or as a blow gun.

Standard of the foundry field for over 50 years. Stocked by leading foundry supply houses. Guaranteed by . . .

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1425 EAST HIGH STREET, HAMILTON, OHIO

Circle 712 on Page 119

NON-FERROUS FOUNDRY METALLURGY

By A. J. Murphy

Covers the general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state to the process of solidification and to the factors influencing properties of casting. Other materials include the part played by gas dissolved in liquid metals, its control and its influence on cast products; factors influencing the grain size of castings, and mechanical properties of castings as complete components compared with the properties in conventional test samples.

497 pages — Price $12.50 Postpaid

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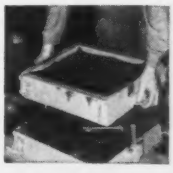
How to improve your aluminum, magnesium castings with B&A® Alkali Fluoborates

and Potassium Titanium Fluoride

In aluminum casting, use B&A Potassium Fluoborate as a purifying flux for removal of oxides. It is an excellent degassing agent, forms a dry dross, and improves fluidity of the molten metal.

Subsequent treatment with Potassium Titanium Fluoride, or a mixture of Potassium Titanium Fluoride with Potassium Fluoborate (for lower melting temperatures), produces a better grain structure in the metal. Improved grain refinement gives increased tensile strength, greater elongation, better machinability, etc.



In magnesium casting, use the B&A Alkali Fluoborates as oxidation inhibitors with both green sand and core sand. They help reduce rejects . . . cores are easier to make, faster to collapse, easier to shake out.

For further information, write or call your nearest B&A office. Ask for technical data on the use of B&A Ammonium Fluoborate, Potassium Fluoborate and Sodium Fluoborate in the light metals industry.

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Circle 713 on Page 119

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

ROBESON PROCESS COMPANY

(Established 1905)

GENERAL OFFICES AND PLANT: • ERIE, PA.

Circle 714 on Page 119

EMPIRE*

"THAT GOOD"

FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION

2201 First Ave., North • Birmingham 3, Ala.

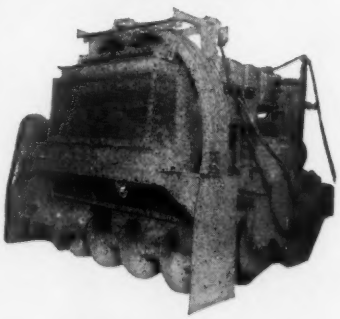
Phone: ALpine 1-9135

*Reg. U.S. Pat. Off.

Circle 715 on Page 119

MORE MOLDS!

You can get up to 25% more molds per hour simply by removing your sand from the floor and cleaning, mixing, aerating and tempering it with a RINGLIFT SAND CONDITIONER. One man can do it. What you save will quickly pay for one of these amazing machines in only a few months. Ask us how today!



STATES ENGINEERING CORPORATION

920 W. Berry St.

Fort Wayne, Indiana

Circle 716 on Page 119

Some of the Many Foundries utilizing Euclid Cranes . . .

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Burnside Steel Casting Co.
Allyne-Ryan Foundry Co.
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EUCLID CRANES

This 10-ton, 3 motor EUCLID CRANE is in operation at TEXAS ELECTRIC STEEL CASTING COMPANY

are FAVORITES in FOUNDRIES

EUCLID thinks, designs and builds foundry cranes with dust proof mechanisms that withstand abrasive, corrosive conditions.

Push-button, rope pendant floor control and overhead cab operation incorporate the latest design improvements for precise load control at all times.

EUCLID SERIES H HOISTS are available in capacities up to 10 tons.

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THE EUCLID CRANE & HOIST CO.

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STRAINER CORES

★ CUSTOM MADE
★ HIGHLY HEAT RESISTANT
★ LOW COST

Exclusive characteristics of **RUDOW STRAINER CORES** makes it possible for you to substantially cut your costs. Moreover, our prices can compete whether you have a supplier, or make your own strainer cores.

RUDOW STRAINER CORES now make it economically wise to convert your present complex gating jobs to the simplified use of our strainer cores.

Prove to your satisfaction that **RUDOW STRAINER CORES** will reduce reject losses and keep castings free of oxides, slag, and other impurities by controlling the flow of metal into the mold.

We invite you to prove our claim by allowing us to furnish free samples of **RUDOW STRAINER CORES**

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Circle 718 on Page 119

Are You Looking

or

Machineability?

Chemical inertness?

High thermal conductivity?

High temperature stability?

Resistance to thermal shock?

. . . then consider GRAPHITE — it has many unique qualities.

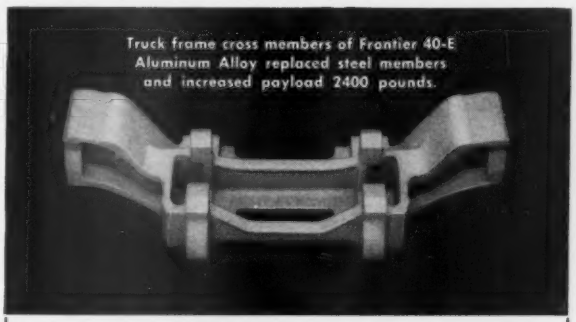
We are specialists in graphite specialties. Our technicians will be glad to work with yours.

ELECTRODE GLC DIVISION
GREAT LAKES CARBON CORPORATION
18 EAST 48TH STREET, NEW YORK 17, N.Y.

Circle 719 on Page 119

MORE PROFIT... for Both User and Producer

when you sell **FRONTIER 40-E** Aluminum Alloy CASTINGS!



Sell Castings

ENGINEERED TO THE JOB—

Sell Customer Service

When customers ask for light weight castings, don't just think of aluminum. Do a selling job. Ask about strength requirements. Would shock resistance be an advantage? How about corrosion resistance? Must the casting withstand high pressure? Talk about weldability and machinability.

Then recommend Frontier 40-E, the self aging, high strength aluminum alloy that has all these desirable features. Being a primary ingot, it is more reliable and can be counted on to give the same results day after day — year after year.

Do more than offer just another casting. Get out of the rut. Offer better castings with better design factors — castings made of Frontier 40-E — formulated to give 25,000 lb. yield strength. We'll back you up with our complete engineering and laboratory service. We'll start you on the road to *more and better* casting business.

Write for complete information today.

FRONTIER BRONZE CORP.
4878 PACKARD ROAD • NIAGARA FALLS, NEW YORK

Exclusive Foreign Producers of 40-E
Doralum Castings Ltd., Darlington, England
Paul Bergsoe & Son, Glostrup, Denmark
L'Aluminum Francais, Paris, France

Circle 720 on Page 119

CLASSIFIED ADVERTISING

Help Wanted

METALLURGIST-MANAGER

$10,000-$15,000

THIS IS THE OPPORTUNITY FOR A METALLURGIST, UNDER 40, TO STEP INTO THE MANAGEMENT OF A 200 MAN ELECTRIC STEEL FOUNDRY. VOLUME TRIPLED LAST 3 YEARS. LOCATED SOUTHEAST.

For Foundry Jobs or Personnel
Contact JOHN COPE, Director
DRAKE PERSONNEL, INC.
220 S. STATE ST. CHICAGO 4, ILLINOIS
PHONE: HARRISON 7-8600

FOUNDRY ENGINEER

1. EDUCATION
Engineering degree (B.S. Level) from accredited university or equivalent technical education, preferably M.E.

2. GENERAL TECHNICAL KNOWLEDGE
Good foundry practices and methods as to sand control, coremaking, melting, pouring, molding, grinding, and cleaning.
Mechanized and conveyorized foundry operations; Dielectric core drying; shell molding; CO_2 process molding.
Metallurgical analysis and control.
Pattern equipment design and layout.
Machining castings.
General metal working industry methods and process.

3. EXPERIENCE
Foundry operations in nonferrous product principally brass and bronze, minimum of 5 years as foundry engineer or equivalent direct experience.
Valve industry background preferred.

4. Position staff capacity; location Connecticut. Confidential handling assured.
Send resume and state salary requirements to:

BOX 173, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

NONFERROUS SUPERINTENDENT

Applicant must have sound knowledge of both permanent mold and sand practice. Capable of designing and laying out permanent molds and patterns for sand molding.
Must be cost conscious and capable of getting most out of men. Located in the middle west. References required. Give education, experience and personal data in reply.

BOX 194, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MELTING DEPARTMENT SUPERVISOR

For mechanized gray iron foundry in Midwest. Must have two years of college and minimum of five years' experience. Age 35-45. Will be responsible for cupola operations, production, costs, etc. Send resume of experience and qualifications in first letter.

BOX 186, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

QUALITY CONTROL TECHNICIAN

Require energetic man with formal training, minimum B.S. degree tending toward ferrous foundry products for wear resistant application. Must know functions of sand control, risering, gating and be interested in stimulating production. Opportunity for advancement to superintendent. Age 27 - 35. Fine opportunity in progressive West Coast Company. Address: Box 166, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Long-established gray iron jobbing foundry in Michigan requires a general foundry superintendent. Prior experience as superintendent required. Excellent opportunity for right man. Send complete resume.

BOX 193, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

STEEL FOUNDRY MELTER—METALLURGIST
Experienced in electric steel basic practice. Position would include direction and supervision of Melt Department and Laboratory. Forward resume of education and experience including salary requirement and availability. Address: Box 178, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

MANAGEMENT
Qualified metallurgist, 36, extensive knowledge production and control high quality gray, alloyed, flake and spheroidal iron castings; cupola, molding and sand control; chemical, mechanical and micro testing. Presently five years service engineer, Meehanite Metal Corporation, but wish to cease extensive travelling. Interested in management end or part ownership of foundry and technical control. Address: CHARLES FORD, 670 E. LINCOLN AVENUE, MT. VERNON, NEW YORK.

INDUSTRIAL ENGINEER
Thirty-three year old graduate of General Motors Institute cooperative engineering program with 13 years' experience in metal casting field, including automotive gray iron, university instructing, technical writing, and pit molding job shop. Will consider any position related to the foundry industry that offers opportunity as well as challenge. For resume Address: Box 190, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Danish, with certificate, desire position as general foreman or superintendent in East only, 21 years' experience in all phases of foundry operations, ferrous and nonferrous. Also estimating from blueprints. Address: Box 185, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT
Metallurgical engineer well experienced in all phases of gray iron, mechanized, captive foundry operations including shell, CO^2 process and newest developments, cost and quality minded, good labor relations. Presently employed, desire similar position with a progressive company. Address: Box 182, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT
Engineering graduate, 37 years old, 18 years' diversified technical and management experience in high production ferrous foundries. Well versed in quality problems, supervision, rigging and pattern design, engineering, and inspection. Consider employment anywhere, foreign or domestic. Employed. Address: Box 199, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT TO MANAGER
Mechanical engineer, age 32. Eight years' diversified experience, including foundry equipment sales engineering. Energetic administrator. Seeking management position requiring creative ability, drive and initiative. Consider product-process development, sales, etc. Address: Box 181, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED
South America, Mexico, Foreign. Capable, aggressive young executive with diversified administrative and technical background, requests opportunity, steel, gray iron, malleable. Address: Box 176, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT
Age 42, 27 years' experience in all phases of gray iron foundry, practical and technical. Proven ability in ductile and high strength gray irons, basic or acid cupolas, jobbing and production. Address: Box 144, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGICAL ENGINEER
Age 27, good background in molding practice, seeking position in ferrous foundry to broaden practical experience. Previous experience includes estimating for large jobbing foundry. Address: Box 168, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT
Practical gray iron foundryman, age 53, technically trained, graduate metallurgist. Broad background of experience—jobbing, paper machinery, machine tool, automotive. Desire contact with reliable firm needing service of high grade foundryman for results. Address: Box 198, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT OR GENERAL FOREMAN
Twenty-five years in supervision, section foreman to plant superintendent. Experienced in all departments of foundry—malleable or gray iron. Prefer malleable job shop layout, gating, trouble shooting. Address: Box 187, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ESTIMATOR
Production, tooling, ferrous and nonferrous, investment castings. Supervisor of fifteen man foundry and machine shop. Production control, tool planning aircraft components. Address: Box 171, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
With 28 years' experience, 9 years night foreman, 13 years assistant foundry superintendent also time in molding and cleaning room work, jobbing shop with floor, rollover, slinger and jolt squeezer machines. Prefer southeastern states. Age 48, now employed, available after October 1st. Address: Box 177, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP SUPERINTENDENT
With 32 years of pattern shop supervision including 20 years operating own job shop, employing 8 to 12 wood and metal patternmakers, and was able to solicit, quote and supervise the construction at a profit. Address: Box 180, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 139, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

FOUNDRYMAN

Young, now employed as Superintendent medium job shop, responsibilities include sales, foundry operations, purchasing, etc. Ferrous, nonferrous metals, strongest in gray, ductile, and Ni-resist irons. Desire to relocate with aggressive company. Address: Box 195, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Graduate metallurgist, five years' gray iron experience including casting development, plant metallurgy, cupola operation, sand control and quality control. Seeking position in medium-sized gray iron foundry. Address: Box 152, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLANT MANAGER—ENGINEER

Present gray iron and aluminum foundry manager desires change. Experience scrap and sand control, metallurgy, sales, production control, union negotiations. Engineering experience, plant layout, manufacturing, tooling, structural steel. Address: Box 188, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES-SERVICE ENGINEERING

Industrial Engineer, 12 years associated with foundry industry, desire opportunity in casting sales or sales-service of ideas, equipment or supplies to foundries. Address: Box 189, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Young foundryman thoroughly versed in all gray iron operations. Degree in Metallurgical Engineering. Interested in responsible position with opportunity. Address: Box 138, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WHAT HAVE YOU?

Twenty-six years' gray iron, bronze and aluminum, job and production foundry experience. Some college education and college teaching experience. Eighteen years supervisory capacity, melting, coremaking, molding patternmaking, sales, engineering, bid estimating, procurement. Would consider foreign duty. Now employed. Age 43. Address: Box 179, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE—SALES OR MANAGEMENT

Fifteen years' experience in all phases of precision casting for major industries, also machine experience. Greater Cleveland area preferred. Address: Box 192, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical and technical, 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 142, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Forty years gray iron, brass, aluminum, supervisor, superintendent, sales estimating. Want responsible position. Will invest, available immediately. Address: Box 183, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGEMENT ASSISTANT

Twelve years' experience in gray iron and aluminum jobbing foundry. Practical knowledge of time study, incentives, standard cost estimating and purchasing. Address: Box 175, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SHELL MOLD SUPERVISOR

Thorough knowledge of shell molding, five years' experience with Shalco equipment. Excellent references, 37 years of age. Address: Box 200 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

IRON FOUNDRYMAN

Thoroughly experienced oldest or newest type foundry. Want challenge and responsibility. Now employed, locate New England only. Address: Box 197, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

With 25 years' experience processing castings of all kinds. Free to relocate. Address: Box 191 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY WORKS MANAGER

Have complete knowledge of all gray iron operations. Want position with a free hand to attain maximum results. Mechanized or one that plans to modernize. If you have such need, I am your man. Address: Box 141, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Steel or iron, coat-off, sleeves-up type man. Jobbing or mechanized. Address Box 196, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representative Available

MANUFACTURERS' REPRESENTATIVE

Graduate Metallurgical Engineer, molder by trade. Over 25 years operating foundries and selling castings. Desire an account selling steel, malleable, ductile iron or nonferrous castings in an exclusive territory within 100 to 150-mile radius of Philadelphia. Address: Box 184, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

CONSULTING ENGINEER
Thirty-five years' Experience
Acid and Basic Practice

Improved methods in electric furnace melting. Low cost with high productivity. Avoid expensive mistakes. Acquire consultation prior to the purchasing of your new furnace and in planning, modernizing, and organizing of your melt shop.

EUGENE H. WEAK 2933 HIGHWAY AVE.
HIGHLAND, IND. PHONE: TEMPLE 8-1244

FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold—and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Representatives Wanted

SALESMEN TO CALL ON FOUNDRIES

Sell nationally known line of quality controlled foundry products—core oils and binders, washes, sand additives and compounds, etc. Major manufacturer now doing multi-million dollar sales volume in a few states is undertaking an expansion program. Men with some foundry "knowhow" preferred. This is a full time opportunity with a challenging financial future. Our organization knows of this advertisement. Reply in strict confidence giving educational background, experience, references, age, marital status, etc.

BOX 201, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

REPRESENTATION WANTED

For HYSOL, the complete line of Epoxy Plastic Tooling Products. Open territories include Illinois, Wisconsin, Florida, Maryland, Washington, D. C., and Texas. For details, write to: MANAGER, TOOLING DIVISION, HOUGHTON LABORATORIES, INC., OLEAN, NEW YORK.

CASTING SALESMAN

A well established Midwestern foundry has an opening for an experienced man to sell large and medium size gray iron castings. Must have foundry experience and be familiar with blue prints, and willing to cover entire Chicagoland area. Address: Box 172, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunities

PERMANENT MOLD METHOD AVAILABLE
THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

NEW SHELL MOLD PROCESS

Blows cope and drag simultaneously, assembles, fuses automatically. Lower mold costs, closer tolerances. Patent applied for. Offer prints, engineering service and license. Address: THEODORE G. BAKER, 17044 BROADWAY TERRACE, OAKLAND 11, CALIFORNIA.

Foundries For Sale

CANADIAN FOUNDRY FOR LEASE OR SALE

Well equipped, ideally located in industrial area of Province of Quebec, 3 production lines, 2 cupolas single shift capacity 30 tons, enamel shop with 2 modern furnaces, buildings approximately 50,000 square feet and 10 acres land available for long-term lease with purchase option or outright purchase.

BOX 174, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE, LEASE, OR JOINT VENTURE

Pressure cast aluminum foundry and pattern shop, now active, specialize in plaster cast aluminum pattern equipment. Sufficiently equipped to produce fifty plates a week. Low price in rent, room for expanding. Good opportunity. Address: EDWARD SWANSON, PRES., ASHLAND PATTERN AND MODEL WORKS, INC., 163-5 CLYMER STREET, BROOKLYN 11, NEW YORK.

FOR SALE

Completely equipped brass foundry, strictly modern. Located at Kane, Illinois. For further information contact: C. H. AUTEN REAL ESTATE AGENCY, 2415 STATE STREET, ALTON, ILLINOIS, PHONE: 3-8522.

Wanted-To-Buy

WANTED TO BUY

PORCELAIN ENAMEL BATCH TYPE OVEN wanted to glass line water heater tanks, also a dryer for same. Address: Box 170, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SAND PREPARATOR

Urgently required B & P Preparator or equivalent to use in conjunction with No. 2 Simpson Muller and Payloader. Address: Box 167, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING MACHINES WANTED

Two Milwaukee, jolt, squeeze, pinlift. Model 215. Advise price, serial number and condition. Address: Box 169, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

For Sale

FOR SALE

WHITING CUPOLAS, 1—#2½ (29" lining), 1—#6 (48" lining, and 1—#7 (54" lining) with Skiphoists and blowers
SPO Jolt Squeeze Pin Lift #2114 (5)
OSBORN Jolt Squeeze #275 JW (Straddle Type) and #276 PJ 13" cylinder
B & P SCREENARATORS, Models "S," "M," and "L"
MIXING LADLE, 2500# cap. with controls—hydraulic
ELWELL - PARKER Automatic Transporter, 2000# cap. with charger
SLY TUMBLING MILLS (several sizes)
HINES and ADAMS ALUMINUM Snap Flasks (assorted sizes)
All of the above in good condition and priced very low for quick disposal.

PHONE OR WRITE:
W. O. McMAHON
BOX 5943, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONE: TREMONT 1-2088

AMERICAN WHEELABRATORS

1—20" x 27" Tumblast Rubber Belt
1—48" x 42" Tumblast Steel Flights/S/L, 66" Swing Table
1—Skew-Roll Wheelabrator for Peening and Cleaning Round Stock and Pipe

PANGBORN

1—14' Type LG-5-461 with CH-2 Dust Collector

DUST COLLECTORS

1—American Air Filter size 16—Type "W," Arrangement "C" with sludge ejector 220/440
1—American Air Filter Size 24—Type "W," Arrangement "C" with sludge ejector 220/440

FOUNDRY ASSOCIATES, INC.
4631 WEST ROSCOE
CHICAGO 41, ILLINOIS
AV-2-1086

WHEELABRATOR FOR SALE

36" x 42" American Tumblast, complete with skip loader, dust collector, timer and exhauster. Excellent condition. Address: WELDON F. STUMP, 4835 CRESTRIDGE, TOLEDO 13, OHIO. PHONE: SYLVANIA, OHIO 22006.

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

6' LF-14 Pangborn Table	$2000.00
4' LG-14 Pangborn Table	2200.00
9' LG-14 Pangborn Table	4500.00
6' LG-14 Pangborn Table	2500.00
Pangborn 8 x 8 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4000.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
4' American Multi-Table	2500.00
15" Continuous Wheelabrator Tumblast	1000.00
8' Wheelabrator Table Blast	2000.00
14 LG5 Pangborn Rotoblast Multi-Table w/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

1—Extra heavy Palmer Bee 42" x 72" Mold Car Conveyor, 106 cars.
1—Dual Headed Automatic Swingslinger, 19" diameter impeller head, 5" tip.
9—Model No. AL-3636 Champion Speed Draw Machines.
1—20' Diameter Roto-Mold Turntable (motor driven).
1—Double spindle U. S. Grinder, variable speed.
1—Practically new #80 Speedmuller.
1—American Sandcutter.
1—American Dust Collector, 2000 C.F.M. Never used.
A quantity of aluminum Squeezer Bottom Boards, variety of sizes.

BROOKS FOUNDRY, INC.
ALBION, MICHIGAN
PHONE: NATIONAL 9-2167

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

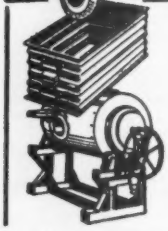
FOR SALE

Simpson No. 1 Muller
Simpson No. 1½ Muller
Simpson No. 2 Muller
American Tumblast, 27 x 36 with loader
American Tumblast, 36 x 42
Fisher Furnaces #600 MNP
Coulter Furnaces #400 MNP
Osborn #405 Rollovers
Elevators
Belt Conveyors
Shakeouts
Milwaukee 165 Pin Lift
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeeze
Osborn 275J, Jolt Squeeze
Osborn 276J, Jolt Squeeze
International LJS, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeeze
Champion JS 10S Jolt Squeeze
Arcade 100S Jolt Squeeze
Spo 110 Jolt Squeeze
Davenport Rollover 28 SA
International Rollover 30 x 8 portable
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
Tabor rollover 30 x 40 portable
J & J 610 B rollover portable
J & J 918 Rollover
International pin lift
Davenport pin lifts
Osborn 559 pin lift
Spo 506 jolt rollover, pin lift, draw
Nichols plain molding machine, high speed
International plain jolt, 36 x 45 table
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
Simplicity preparators
B & P preparators
Blystone sand mixers
Coleman core ovens
Porbeck core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 lb. to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives.
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"
JACKETS
Aluminum and Iron
STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'
CORE PLATES
Transite —— Iron —— Aluminum
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY — SELL — TRADE
THE HOMAN MACHINERY CO.
710 E. FRONT ST. MAIN 10339
CINCINNATI 2, OHIO

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD **CLEVELAND 10, OHIO**



DUST COLLECTOR
1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.

WHEELABRATORS
1—27" x 36", 5 cu. ft. Tumblast, w/loader
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—42" x 48", 17½ cu. ft. Tumblast, w/loader
1—36" x 42" air blast Wheelabrator

CRANE
1—Overhead floor operated, 40 ft. span, 5 ton cap.

HEAT TREATING FURNACES
2—4860EH Lindberg, 220 Volts, 90 KVA.

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B-P double belt, 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE:
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

CLASSIFIED ADVERTISING

For Sale

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models: 307-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

International Core Blower, model SB-13, serial No. 40384, 1941, Clark No. 9697. Name your price. Can be inspected at Buchanan, Michigan plant.

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

SHELL MOLDING MACHINE

Late model Shell Process automatic molding machine—pattern size 20" x 30", gas fired. 220-60-3, excellent condition, operating now.

J. T. MOORE
WELLS MANUFACTURING COMPANY
SKOKIE, ILLINOIS

For Sale

FOR SALE

Used H3 Bucyrus Hydrocrane mounted on Model L160 IHC truck chassis with individual truck cab. Crane complete with hydraulic clam shell and tag line. Also, 29" magnet with Onan 5,000 watt, 220 volt, 21.8 Amp motor generator including retriever reels, tag line, etc. Truck chassis has 2,200 miles. Tire size 8¼ x 20 ten ply with hydraulically operated outriggers. Hydrocrane includes telescoping boom with totally enclosed crane cab. All in excellent condition and available for inspection.

WELLS MANUFACTURING COMPANY
SKOKIE, ILLINOIS
J. T. Moore

FOR SALE

P & H 3-TON BRIDGE CRANE

Two motor, single I beam, top running, floor controlled Travlift crane, 27'2" center to center runway span. Speeds: hoist 24 fpm, 5 HP; trolley hand geared; bridge 175 fpm, 3 HP; 5 speed manual pushbutton control with time delay relays on last two steps of acceleration; runways 12'-9¼" above floor line, 69'-2" long. Price $2500.00.

ELECTRO-ALLOYS DIVISION
TAYLOR ST. & ABBE ROAD
ELYRIA, OHIO

FOR SALE

#1 SIMPSON MULLER
FOR THE BEST DEAL CALL

BALCHER MACHINERY COMPANY
695 E. 152nd Street
Cleveland 10, Ohio
Telephone: GLenville 1-2474

For Sale

FOR SALE

Pangborn Rotoblast Type ES-192, designed for cleaning of bath rubs. Unit complete with Schneible Collector, 825 gallon skim tank—two pumps. Blast cabinet 45'6" x 11'6". Seven rotors with 20 HP motors, 36 hooks on trolley conveyor—2 grit elevators, 6 separators. Spare parts inventory included. Unit offered on as is—where is basis.

RHEEM-RICHMOND PLUMBING FIXTURES
DIV. RHEEM MANUFACTURING COMPANY
P. O. BOX 111
METUCHEN, NEW JERSEY
Attention: Purchasing Department

FOR SALE

All of our foundry equipment, including two electric furnaces, cupolas, compressors, Wheelabrators, Surface Combustion box type oven, core ovens, molding machines, casting bins, in fact our complete foundry.

MEMPHIS CASTING WORKS, INC.
1006 OAKLAND AVENUE
MEMPHIS 1, TENNESSEE

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt

WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

Now Liquidating

Oliver Corporation's Gray Iron and Malleable Foundries at 533 S. Chapin St., South Bend, Indiana. LATE TYPE Foundry Equipment.

FOUNDRY

11—MULLERS, 5—B&P #80; 1—B&P #70; 1—B&P #60; 2—B&P #40's with skips; 2—Clearfield #930, with new style crossheads.

8—MOLDERS HOPPER LINES—150 Hoppers.

10—"NO LEAK" Steel Slat Conveyors.

3—MOLD CONVEYORS.

20—Belt Conveyors, Trough and Flat Belt, some have magnetic pulleys.

8—Revivifiers and Sand Screens.

8—Overhead Sand Bins 1000 to 4000 cu. ft.

11—Shakeouts: Robbins, Simplicity, Link-Belt.

5—Oscillating Pan Conveyors.

10—Bucket Elevators 41 to 60 feet.

B&P Slinger, Turntable, Plate Feeder.

135—MOLDING MACHINES, JOLT SQUEEZE PIN LIFTS: SPO 2222, 2160C, 2160, 2148, 2136, 214, 113J, and 110J; OSBORN 276J and 275J. ROLLOVERS: SPO 507, and 506; JOLT SQUEEZE ROLLOVER DRAW 413D, PIN PUSHOFFS B&P AL2428.

7000' Roller Conveyor 12" to 26".

CLEANING ROOMS

American Shot Blast, 3-48" x 48"; 3-42" x 36"; 4 Whiting geared motor drive tumbling barrels—12—HISEY WOLF Grinders, 30" to 18" wheel sizes—Wood Slat casting sorting conveyors.

3—Whiting Hydroclone Dust Suppressors.

5—Rotoclones—3 Bay type Dust Collectors.

CORE ROOMS

Core Blowers: 3—Demmler 2K, 2 Demmler #2; 4 Demmler #1; 1—Demmler #50; 2—International SB13; 9—Redford Bench type Rollovers; 1—Spo 507; 2—Spo 506; 1—International R.E.D.P. 6—Hand Rollovers. Coleman Car type and Young Brothers continuous core ovens, core racks, core buggies.

HEAT TREATING

3—General Electric 5 Ton Electric Annealing ovens 1750° and 1350°.

MELTING DEPARTMENT

Cupola—4 Whiting #7; 2—Whiting #6.

WHITING HYDROARC ELECTRIC DUPLEXING FURNACE.

2—Whiting Air Furnaces, 2—30A Coal Pulverizers.

2—Whiting 7½ Ton OET cranes 108' span.

Whiting Tiger Charge Crane—3 Whiting U holding ladles. Overhead scrap storage, charge and weigh hoppers, Canton Shear, 55" Magnet.

3—Whiting Allis Chalmers Cupola blowers. Whiting Slag Disposal Units.—36 Modern Pouring devices, Scales 100# to 12,500#.

CRANES

2—Whiting 7½ Ton 108' Span OET Cranes.

42—CLEVELAND Bridge Cranes, 800' 10" arch beam, 2000 feet "T" Rail.

15—CLEVELAND Hot Metal Carriers, 2600'-10" Arch beam rail.

11—Electric Monorail Hoists 1—5000#.

3 STRAIGHTENING PRESSES: 500 TON H.P.M.; 50 TON and 25 TON OIL GEAR.

AIR COMPRESSOR—300 H.P. Synchronous Chicago Pneumatic.

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AIR COMPRESSORS

1—JOY Class WE 114C, Size 15½ x 9¼ x 7, 1800 CFM, w/300 HP Motor.
1—CHICAGO PNEUMATIC, Style OCE, Size 26 x 15 x 18, 2200 CFM, w/350 HP Motor.
1—SULLIVAN Class WE-4, Size 18 x 11 x 14, 2100 CFM, w/350 HP Motor.

AIR & ELECTRIC HOISTS

75—INGERSOLL RAND, Air Motor Type, Sizes LC-7, B, C, D, D-6 & E, 700 to 10,000# Capacity, w/Trolleys & Pendent Controls.
12—YALE & TOWNE and CLEVELAND TRAMRAIL, 1/2, 1 & 2 Ton Capacity, w/Trolleys. 220/440 Volts.

BELT CONVEYORS

2000' BARTLETT & SNOW 18" Wide, From 10' Centers through 150' Lengths. Some Flat, Some Trough. All with Individual Motors & Drives. Some with Magnetic Pulleys.

BUCKET ELEVATORS

5—BARTLETT & SNOW, From 25' Centers to 50' Centers, Belt 13" Wide, with 12" x 7" Buckets.

CORE ROOM

Core Ovens

1—DESPATCH 4' x 6' x 6', Batch Type.
1—GEHNRICH, 2-Compartment, 4' Wide, 3' Deep, 5' High, Each Compartment.
1—CARL MAYER, 5-Compartment, 7½' High, 6½' Wide, 14' Deep, Each Compartment. Swing-out Doors.

Core Room Misc.

LEWIS #7, CLIMAX #2½, KANE & ROACH #DX-5 Core Wire Straighteners. INTERNATIONAL Type GR, TABOR Size 30 Core Rollovers. REDFORD #2 & #4 Core Blowers.

CRANES

CHISHOLM MOORE 2 & 5 Ton Capacity, 26' & 40' Spans, Floor Controlled.
CLEVELAND TRAMRAIL 1 & 2 Ton Capacity, 15, 20 & 30' Spans. Floor Controlled.

DUST COLLECTORS

PARSONS Bag Type & AMERICAN AIR FILTER Rotoclone Type, 5,000 to 20,000 CFM.

FURNACES—HEAT TREAT & AGING

5—ELECTRIC FURNACE CO. 8' W., 13' L., 12'9" H. Recirculating to 1200°.
1—DESPATCH Type S, 6' W., 16' L., 7'7" H.

GRINDING EQUIPMENT

U. S. #64 Double End Snag Grinders, MARSCHKE Swing Frame & HASKINS Flexible Shaft Grinders.

GRINDING BOOTHS

6—AMERICAN AIR FILTER, Type N, Size #1½, Class 500.

MACHINE TOOLS

1—BULLARD Cut Master, 36" Vertical Turret Lathe, Spiral Drive.
LODGE & SHIPLEY, PRATT & WHITNEY, SOUTH BEND Engine Lathes & Bench Lathes. STANDARD, FAMCO Punch Presses. Drill Presses, Tool & Cutter Grinders, Milling Machines, Shapers, Threading Machines, etc.
TANNEWITZ 30 & 42" Throat Metal Cutting Band Saws, Motorized.

MELTING FURNACES

30—Aluminum Melting Furnaces, 200, 400, 500, 600 & 2000# Crucible Capacity. Gas fired.

MOLDING MACHINES

Jolt Squeezers

15—OSBORN #275-J & 276-J, Portable.
5—SPO #113-J, Portable.

Jolt Pin Lift

SPO Model #3070, MILWAUKEE #1030.

Jolt Rollover Pattern Draw

10—HERMAN, 750, 1500, 3000 & 6000# Series, 24" x 36" Table to 40" x 96" Table. All w/Air Clamps.
3—OSBORN #405, 30" x 60" Table.
1—J & J #612 RPB, 24" x 30" Table.

PATTERN SHOP EQUIPMENT

DELTA Band Saws, Drill Presses, Jointer & Planers, Rip & Cut-off Saws, DEWALT Table Saw, WALKER-TURNER Radial Drill & Flexible Shaft Grinders, Disc Sanders, etc.

SAND MULLERS

1—B & P #3½ Mulbaro.
1—SIMPSON 18" Dia. Lab Muller.
2—SIMPSON #1 Model UD Sand Mullers.
2—SIMPSON #1½ Model UD Sand Mullers.
2—SIMPSON #2 Model UD Sand Mullers.

SAND & SHOT BLAST EQUIPMENT

1—AMERICAN WHEELABRATOR Tumblast, Size 20" x 27", Rubber Belt.
1—NEW HAVEN Sand Blast Barrel, 36" Dia. x 48" Depth.
3—PARSONS Sand Blast Rooms, 10' x 8' x 8' High w/6' Dia. Turntables.

SAND STORAGE BINS & HOPPERS

BARTLETT & SNOW, 2 & 3 Compartment Sand Storage Bins, 8, 16 & 90 Ton Capacities. Gates on Each Compartment with Measuring Hoppers.
30—BARTLETT & SNOW 2000 & 4000# Capacity Moulders Hoppers.

SAND SCREENS & SHAKEOUTS

3—BARTLETT & SNOW 22" Dia. x 26" Long, 54" Dia. x 8' Long, 48" Dia. x 12' Long Rotary Sand Screens. All Motorized.
6—SIMPLICITY Model SOB & SOBG, 3' x 8', & 4' x 8' Shakeouts, 5000 & 8000# Capacity, Motorized.

SCALES

TOLEDO Platform, Bench Type & Portable, Open Face Dial Scales. 200 to 6250# Capacity, 18" x 20" to 48" x 72" Platforms.

ROLLER CONVEYOR

2000' MATHEWS, 12, 14, 16, 18 & 36" Widths, 2 9/16" & 3½" Dia. Rollers on 3, 4 & 6" Centers. All above rail.

X-RAY & LAB EQUIPMENT

1—G.E. Model KX-10 Industrial X-Ray.
1—G.E. Model 14-C X-Ray Film Developer.
2—KELEKET Film Viewers & Cabinets.
DIETERT SAND Test Lab Consisting of Scales, Balances, Pyrometers, Hardness Testers, Compression Instruments, Moisture Tellers, Ovens, etc.
HOSKINS Lab Furnaces, DETROIT Hardness Testers, BAUSCH & LOMB Cameras, Color Meters, Potentiometers & BLACKLITE Inspection Units.

LIFT TRUCKS

AUTOMATIC TRANSPORTER Fork Lift, 7000# Capacity.
1—BAKER Electric Boom Truck, 6000# Capacity at 7' Radius.
1—BROWNING Truck Crane, 20 Ton Capacity 60' Boom.
8—LEWIS SHEPARD & YALE & TOWNE 2000, 3000 & 4000# Capacity Platform Trucks, 26" x 60" Platform & 48" x 72" Platform, All with Exide Batteries.

SHOP EQUIPMENT

Consisting of Steel Stacking Bins, Metal Shelving, Shop Trucks, Metal Clothes Lockers, Vises, Chain Falls, Fire Extinguishers, Pneumatic Jacks, Air Reels, Spray Tanks, Electric Drills, Electric Motors, Car Pullers, Benches, Racks, Man Cooler Fans, Motor Generator Sets, Jib Cranes, etc.

AIR TOOLS

Approximately 300 INGERSOLL RAND, CHICAGO PNEUMATIC, ARO, MASTER, CLECO Drills, Chipping Hammers, Air Grinders, Core Breakers, Bench & Floor Rammers, Peening Guns, etc.

NEW SUPPLIES

$50,000 Value

Consisting of Boric Acid, Steel Shot, Oil, Dusting Flux, Mullite, 18" Conveyor & Elevator Belt, X-Ray Film, Core Wire, Dye, Rosin Sand, & New Spare Parts for Majority of Equipment.

OFFICE EQUIPMENT

Consisting of KODAK Verifax Copying Machine, #1250 MULTILITH, ADDRESSOGRAPH #1900 Addressing Machine & GRAPHOTYPE Machine w/Cabinets, FRIDEN Electric Calculators, NATIONAL CASH REGISTER Billing Machine, PITNEY BOWES Stamp Machine, BURROUGHS Comptometers, ROYAL & REMINGTON Typewriters both Manual & Electric, Filing Cabinets, Electric Water Coolers, Aluminum Arm & Swivel Chairs, Executive Desks, Fans, Kardex Files, Safes, Blue Print Cabinets, Waste Baskets, etc.

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BLOWERS

25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS

1—20" x 27" AMERICAN WHEELABRATOR, Rubber Belt
1—27" x 36" AMERICAN WHEELABRATOR TUMBLAST, Rubber Belt
1—36" x 42" AMERICAN WHEELABRATOR TUMBLAST
1—48" x 42" AMERICAN WHEELABRATOR TUMBLAST, w/loader
1—36" Continuous AMERICAN WHEELABRATOR, side discharge, two heads, Serial #A95643. New 1953. Used 2 months
1—#1-A Multitable AMERICAN WHEELABRATOR, 6-26" tables, New in 1954, w/dust col.
1—PANGBORN TABLAST, 8' Table, 2500#
1—PANGBORN Rotoblast, 6 cu ft, rubber belt, w/skip loader & dust collector, New 1952
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round, complete

CONVEYORS

1—JEFFREY, 3 compartment, ingot mold
1—LINK-BELT, vibrating, 80' x 24", w/exhaust hood
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK-BELT, 30" Steel Apron Conveyors, 100' Centers
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES
200 ft. WESTOVER Track w/100 Aluminum Pallets 31" x 19"

CORE BLOWERS

1—CHAMPION CB-10
10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS

1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap. Never used. Fraction of cost!

DUST COLLECTORS

1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING

1—250 Lb LECTROMELT, Side Charge
1—500# LECTROMELT
1—3000 #/hr LECTROMELT
1—3000# HEROULT
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC

1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING

1—3 KW, AJAX, Lab type
1—35 KVA, AJAX SPARK GAP, High Freq.
1—333 KW, AJAX, 1000# steel

FRACTION OF COST
3 Ton Top Charge
SWINDELL ARC FURNACE
Unit is in Excellent Condition, Dismantled, ready for Immediate Delivery.
IMMEDIATE DELIVERY

FURNACES—GAS & OIL

1—FISHER MNP, Gas Tilting, 1700#
1—400# FISHER MNP, Gas Fired
1—400# FISHER, Oil, Stationary
1—250# FISHER, Oil, Tilting
3—Stationary, Gas, 250# to 1000#
1—HAUSFELD, Tilting, 1200# capacity
1—STROMAN, Gas, 1000# cap. Alum., auto control hyd. tilt.
1—STROMAN, Gas, 600 lb, "U" Type

FURNACES—HEAT TREAT

1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—20" x 24" deep, L&N Homocarb electric
1—20" x 36" L&N Draw electric

MOLDING MACHINES

Jolt Rollover Pattern Draw

3—J & J #1020, 50" x 60" Table, 3000#
1—J & J #918, 44" x 54" Table, 18" draw
2—HERMAN 10,000#, 48" x 109" tables
1—HERMAN 6000#, 42" x 78"
1—HERMAN 3000#, 30" x 66" table
5—HERMAN 1500#, 30" x 48" tables
3—HERMAN 750#, 30" x 36" tables
2—INTERNATIONAL, 13" x 17" tables
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30" w/air clamps, 1000#
2—TABOR 14" x 16" Rockover, 150#

Plain Jolt

2—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#

Jolt Pin Lift

1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
3—SPO #305, #307, 750 lb, 1500 lb
1—TABOR 17" x 20" table, portable
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift

2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
1—OSBORN #716 PJ, 22" x 34" table, 1250#, 7" draw, stat.
5—SPO #2114P, 21" x 27" table, 600#
5—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers

4—INTERNATIONAL #10 LJS, 17" x 20"
1—MILWAUKEE #104-5, 17" x 21", port.
1—NICHOLS #12 F-P, portable, 600#
31—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#, stat. & port.
3—OSBORN #275J, 17" x 26" table, 13" squeeze, 500# port.
2—SPO #110J, 17" x 20" table, port.
8—TABOR 3" jolt, 18" x 20"

MATERIALS HANDLING

1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—CLARK, Fork Lift, Gas, 3,000 lb, capacity. Solid Tire
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS

1—B & P #30 Speedmullor, 3 cu ft batch
1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia, arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
1—CLEARFIELD #610, 6' Dia., 10 to 14 cu ft batch, w/loader
1—MULLER Plaster & Mortar Mixer, 3 cu ft batch, Pneumatic Tires
5—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Unit Drive, with loader 20-25 cu ft batch

LADLES AND POURING DEVICES

Bottom Pour

2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour

1—WHITING 40" x 40" top dia. geared

Cylindrical

8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

Pouring Devices

7—WHITING, 650# to 2000# gross cap

OVENS

1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
2—GENRICH, Elec., 3 drawer, preheating, auto-conrol, 9' H & 8' W x 6'7" L
1—KOCHS BROS. Electric, 36" x 40" x 64" inside
1—PORBECK, gas, 5 drawer core oven
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'
1—THERMONIC Dielectric Core Oven, Model M900-A

SAND CONDITIONING

3—B & P Screenarator, Model "S" & "M"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—AJAX SAND PREPARATOR Unit w/-permanent magnet pulley
1—HAND SANDY-REDDY SANDY unit, like new
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP motor
1—ROYER, NC-4, 10-15 tons/hr, 1½ HP motor
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
1—ROYER, NDP 15-25 ton/hr, 2 HP

SAND CUTTERS

1—AMERICAN, 15 HP, 96/7S Reel
1—AMERICAN, 10 HP, 48" Reel
1—MOULDERS' FRIEND, 61" brush, reversing control, Like New, Good Buy!

SAND SLINGERS

1—B&P Stationary, 2 Speed, 19" head, 4" tip
1—B&P Stationary, Single Speed, plate feeder
1—B&P Tractor Type, 19" head
1—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS

1—SIMPLICITY Vibrex screen, 3' x 8'
1—ROBINS 48" x 72", Like New
1—ROBINS Vibrating Screen, 36" x 78"
1—SIMPLICITY 50" x 116" shakeout

MISCELLANEOUS

1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
1—PATTERSON-KELLEY Twin Shell Dry Blender, 3 cu ft capacity
FLASKS, CORE PLATES, All Sizes
500,000# Hyd. Compression Testing Machine
4" FOOTBURT Horiz. Bar Mill
5 Ton WELLMAN Charging Machine
1—TABOR Cut-Off Saw, 7½ HP motor
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cinn., Gardner, 5, 7½ & 10 HP

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AIR COMPRESSORS

1—I-R, model XRB, 125 HP, synch. motor, L.H. cyl. 8" x 10", R.H. cyl. 13" x 10".

AIR & ELECTRIC HOISTS

15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, ¼, ½, 1 ton.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—TABOR C10AF, 16" wheel, 10 H.P.
3—TESSEMER H & L Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13 SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SAN-BLO Model 40P-1, w/pulsator.

CORE OVENS

1—CARL MAYER 2-Compartment, oil fired, I.D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model MS00A Dielectric. Cap. 900#s per hour.
1—YOUNG BROS. 6' x 6' x 9' double door, rack type, gas fired.

CUPOLA BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10 500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
1—ROOTS CONNERSVILLE Type RCS Size 20 x 60 w/75 HP motor.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—TOCCO 20 KW Induction Unit, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilting. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
29—LINDBERG FISHER & CAMPBELL, HAUSFELD Stationary, Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Iron.
1—STROMAN, Model "U," 600# Reverberatory Hand Tilt.

HEAT TREAT FURNACES

1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP. 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder. 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles, 2 & 3 ton capacities. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—HERMAN 8' x 12' table, 32,000# cap.
1—J&J 50 x 72 Table—5000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Sizes 20" x 8", 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 X 10" draw, 36" x 36" Table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102, 42" x 50" Table.

Pin Lift

9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs, up to 30" x 40" flasks.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
MILWAUKEE No. 165, 24" x 30" Table, 16" sq. cyl.
3—MILWAUKEE #196, 17" x 38" Table, 19" cyl.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORNS 714PJ, 20" x 31" Tables.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 26' L x 4" deep pan
1—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12", 18" & 20" wide. 2⅞" dia. roller, 4½" hex shaft centers, 4" channel.
500—MATHEWS 12" & 36" wide, 3½" dia 1" hex shaft on 6' centers, 6" channel.

Mold

3—LINK-BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

MOLDERS HOPPERS & STORAGE BINS

7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #40, Speed Muller, 6 cu ft.
1—B & P #50, Speed Muller, 9 cu ft.
1—B & P #60, Speed Muller, 12 cu ft.
2—B & P #70, Speed Mullers, 18 cu ft.
2—CLEARFIELD No. 610 w/skip hoist loaders. 10 to 14 cu ft batch.
CLEARFIELD #404, 4 cu ft cap, 5 HP.
1—DFAVO-DOYLE 6 cu ft cap, Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON No. 1H Style UD—500#.
1—SIMPSON #1½, Style UD, 700 lb, w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
SIMPSON "PORTO-MULLER," 3 cu ft cap.
2—Mixer Muller, 6 cu ft paddle type.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
1—MOULDERS' FRIEND 60" Brush.

SANDSLINGERS

1—B & P Motive Jr., 300 cu ft tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10', 6 ton cap.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
2—ROBBINS 3' x 5' JF6—2000#.
1—ROBBINS 4' x 6' JF9—8000#.
1—ROBBINS 4' x 8' JF9—10,000#.
1—ROBBINS 6' x 10' JF11—20,000#.
1—ROBBINS 8' x 10' JF11—30,000#.
1—SIMPLICITY 4' x 6' Model B.

SAND BLAST EQUIPMENT

1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7-14" tables.
1—AMERICAN No. 2A multi-tablast.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN No. 53 type EN-2 blast cabinet with dust collector.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN #44NF Shot Blast Room 10' x 9' x 9'.

TUMBLING BARRELS

13—SLY & WHITING. All late type units, with gearhead motors and built in magnetic brake. Timken bearings. Following sizes: 30" x 48", 24" x 48", 30" x 60", 36" x 84", 42" x 72", 48" x 72", 48" x 96", 72" x 120".

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24″ x 263′ — 24″ x 120′

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GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
INGERSOLL-RAND 10,000 cfm., 32 oz., 150 hp., 220 V.
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CONVEYOR OVERHEAD CHAIN
1700′ JERVIS B WEBB and LINK-BELT #678 with trolleys 36″ centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36″ x 162′ LINK-BELT Oscillating Pan 10 hp., 220-440 V.
36″ x 53′ LINK-BELT Oscillating Pan
17′ BARBER GREEN Bucket Conveyor
30″ x 25′ Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18″ x 10′ Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16″ x 120′ Rubber Belt w/drives

CORE BLOWERS
REDFORD #2 up to 5# cores
REDFORD Bench types, horizontal or vertical clamping
2—CB15 up to 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½″ draw
DEMMLER #4 up to 250# cores
DEMMLER #3 up to 35# cores
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
7—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42″ table

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28′ Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12″ draw

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P&H 3 TON Electric Traveling DC motors 50′ span
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10 Ton SHAW BOX electric hoist

CUPOLA GUNS
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BONDACTOR #1000

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PARSONS 40,000 cfm. cloth bag type

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1—"LECTROMELT" Size S 1000# per hour, 500 KVA 7200 Volt
LECTROMELT 500#, Size T, 300-375 KVA 2300 V primary, Moore controls, G.E. circuit breaker

ELECTRIC MELTING FURNACES
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1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.
2—DETROIT "LFC" 350# Tapered shell 7200 V.

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty. pot type
1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 Gas Fired Crucible
3—CAMPBELL HAUSFELD Gas Fired 625# brass hand tilt

GRINDERS, SNAG
FOX 24″ x 2″ Single Wheel 10 hp.
2—HAMMOND 20″ DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20″ DE Porter Cable backstands 10 hp.
1—HAMMOND 24″ x 2″ x 12″ 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30″ x 3″ wheel

GRINDERS, SWING FRAME
MARSCHKE 24″ x 3″ x 12″ 20 hp., 220 V.
U.S. 24″ x 3″ x 12″ 15 hp., 220-440 V.
U.S. 20″ x 2½″ x 6″ 10 hp., 220-440 V.
2—MARSCHKE 3 hp., 12″ wheel
1—B&D 7½ hp.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20″ disc and 20″ x 3″ x 1½″ wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42″ x 40″ Electric

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SHAW BOX 5 TON floor control hand travel
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1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
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1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24″ x 32″ flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE TABLE, 24″ x 30″
2—#125-3 MILWAUKEE TABLE, 21″ x 27″—12″ cyl.
5—OSBORN 712 PJ, 18″ x 21″ table
1—CHAMPION JSL10P 18″ x 21″ table 6″ draw
2—#2114 G. SPO TABLE, 26″ x 27″—11″ cyl.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16″ x 20″ table
1—SPO, 110J Portable 17″ x 20″ table
4—CHAMPION, JS10P 18″ x 21″ table
2—OSBORN 275PJ

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60″ x 50″ table
JOHNSTON & JENNINGS 918, 44″ x 64″ table, 20″ draw, rollout table
2—750# HERMAN 20″ x 30″ table
20″ x 8″ INTERNATIONAL type G, 20″ x 30″ table
2—INTERNATIONAL RJ 20″ x 12″
DAVENPORT 28A, 1500#, 29″ x 40″ table

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 26″ x 27″ table, 8″ draw

PIN LIFT PUSHOFF
CHAMPION 28″ x 42″ table
MILWAUKEE 620ND 20″ x 24″ table

MULLERS and MIXERS
2—#1 SIMPSON Mullers

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
1—B&P Tractor, 19″ heads
B&P 2 speed 40/25 hp. double belt
B&P Plate Feeder, 5 ton
B&P w/plate feeder
B&P sand slinger head w/Syntron feeder and hopper
2—NEWAYGO super Handy Sandy sand handling systems. Like new

SAWS, BAND
30″ LAIDLAW, Metal Cutting hydraulic feed
30″ TANNEWITZ, 3 hp., 440 V.
42″ TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3′ x 8′ SIMPLICITY

SHAKEOUTS
3′ x 5′ SIMPLICITY
5′ x 6′ SIMPLICITY
4′ x 10′ SIMPLICITY

SHOT BLAST
SLY #4, 20″ x 20″ w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼″ stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
2—ROYERSFORD, 42″ x 72″, chain drive, late
WHITING 60″ x 72″ 20 hp. drive
SLY 42″ x 42″ x 64″ 10 hp.

WHEELABRATORS
2—42″ x 48″ AMERICAN Skip Loaders
1—27″ x 36″ AMERICAN Skip Loader
3—44-48 HOLLINGSWORTH
1—1A AMERICAN Tablast w/25″ tables
1—#2 AMERICAN Tablast w/27″ tables
1—27″ x 36″ Rubber Belt AMERICAN w/skip loaders

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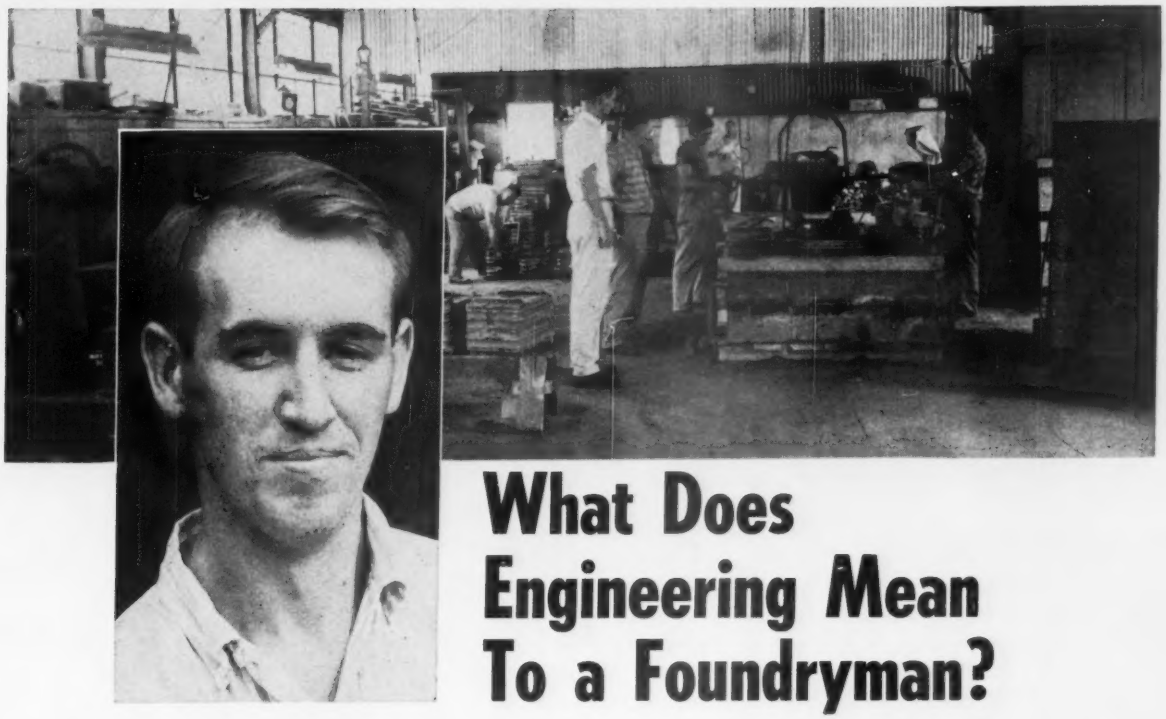

What Does Engineering Mean To a Foundryman?

Plenty! Successful operation of small as well as large FOUNDRIES depends upon the ability to apply engineering "know-how". A young engineer can apply modern technology to *your* foundry to:

1 . . . . . CUT COSTS
2 . . . . . LOWER REJECTS
3 . . . . . IMPROVE PRODUCTS
4 . . . . . INCREASE SALES

CASE IN POINT: GEORGE L. MEADE FOUNDRY, BEDFORD, MASS. NONFERROUS; 8 MEN

David G. Meade (age 25) prepared himself to take over his father's small specialized nonferrous foundry by earning a B.S. degree from Tufts in Chemical Engineering (1954), and a Master's degree in Foundry Engineering, Metallurgy Department, M.I.T. (1958).

Today, he divides his time between *technical sales contacts* and introducing *modern foundry techniques* in Meade Foundry. Dave has introduced intricate wave guide work, plaster casting, procedures for making "high strength-high ductility" aluminum castings and is developing other techniques for making *high quality* castings in production.

Today over 25% of the business of the George L. Meade Foundry is for *new customers*—business that is a direct result of Dave's technical efforts. How can *you* obtain the technical talent needed in your foundry? You can help create a source of foundry engineering talent by participating in FEF's Engineering Educational Program.

Foundry Educational Foundation

1138 TERMINAL TOWER BUILDING • CLEVELAND 13, OHIO

The Foundry Educational Foundation does not pay for this advertising. This advertisement has been prepared and the space contributed by FOUNDRY magazine in support of FEF's constructive program for foundry industry progress through education.

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NONFERROUS TOO!

Two, Model "F" pouring devices pouring aluminum floor treads and corner protectors for Wooster Products Inc., Wooster, Ohio.

ONE-MAN POURING, This Easy Way—

MODERNIZED pouring, directly into the nonferrous molds from graphite crucibles, saves backs and bucks too! It's a safe, winning combination "straight-thru" from monorail track to crucible spout:

- Trolleys are designed for the safe, fast movement of molten metal . . .
- Anti-friction-bearing, swiveling hook-eye permits smooth, easy turning for right and left spotting . . .
- Steel, cut-tooth machined rack is rigidly supported by machine-turned rollers in the side arms. No sway! No spill!
- Bail with quick-detachable hooks safely grip the trunnions . . .
- Tilting action is transmitted from hand-shank through machined-ring which fits contour of the crucible. Raised trunnions lend proper support and balance . . .

MODERN — the original pouring device affords rigid, straight-line, positive control from monorail to crucible spout.

FOR OTHER FACTS AND COST FIGURES ASK FOR CATALOG P-152:

50 PAGES OF POURING FACTS

Catalog P-152 illustrates construction features and production facts on MODERN pouring devices, crucibles, ladles, cranes and monorail systems. Eighteen types of ladles, as grouped by series numbers, diameters and metal capacities, match-up metal loads with gross lifting capacities.

MODERN

NEW
Catalog P-152
mailed on request

Circle 722 on Page 119

MODERN EQUIPMENT CO. Dept. F-9, Port Washington, Wis.
Mail to my attention, new catalog P-152
Also send information on mechanical charging ☐ dust abatement control ☐ cupolas ☐

Company .....
Street ..... Zone .....
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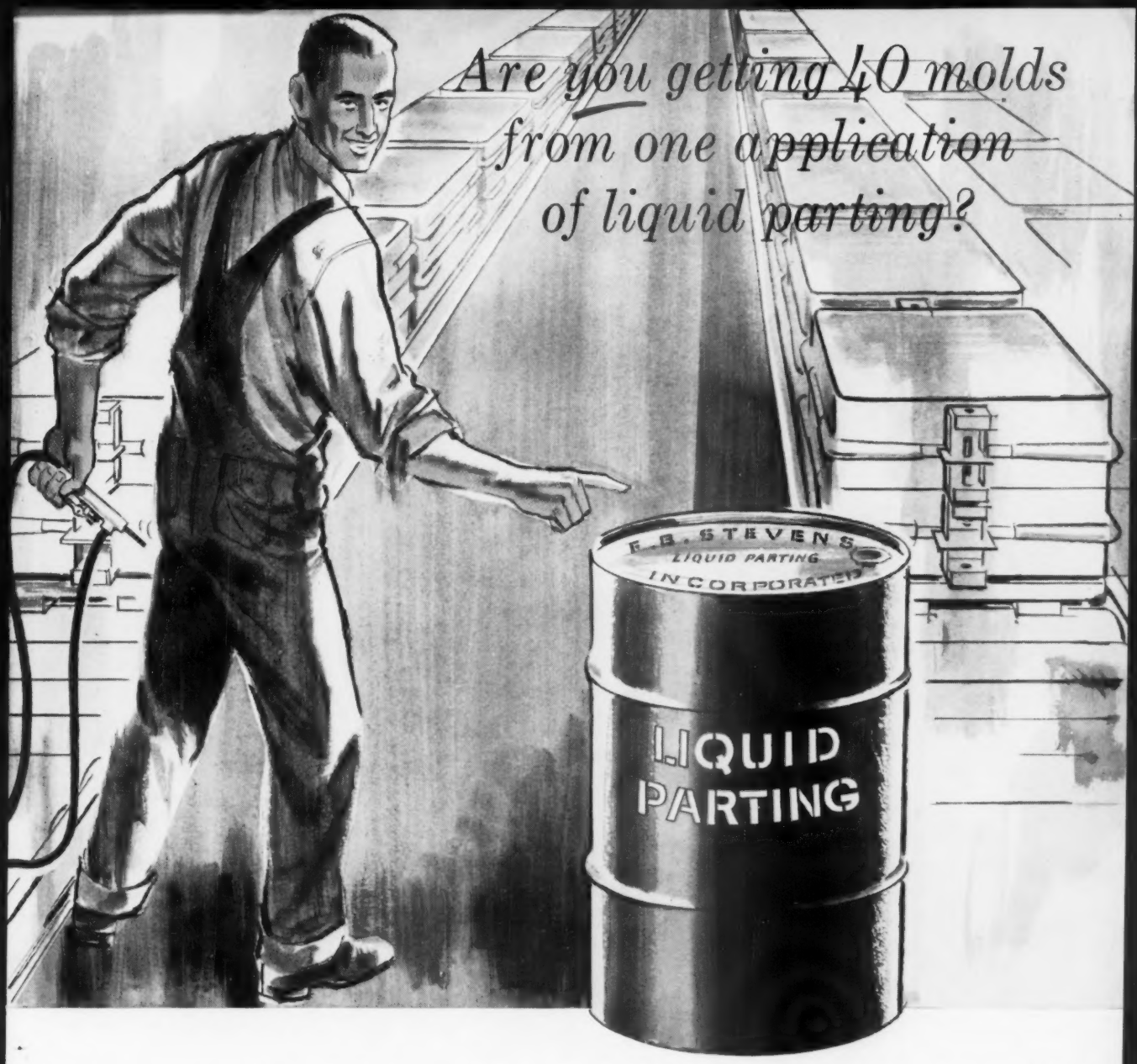
My Name .....



"I am, with STEVENS Liquid Parting!"

Foundry after foundry reports 30, 40, even as high as 60 molds from *one* application of STEVENS Liquid Parting. *And*, they're coming away clean!

STEVENS Liquid Parting is the *biggest* selling liquid parting in the world . . . because

IT GIVES YOU . . .

1. **The fastest, most economical mold preparation!**
2. **It assures you the best detail in final castings!**
3. **It saves you up to 200% in parting materials!**

(NO WASTE—NO DUST)

Unlike dry partings, by the *direct* application of STEVENS Liquid Parting to a pattern, you get complete coverage in a one time-saving application. It covers the pattern quicker . . . more thoroughly, and leaves a tough, lasting film!

For the cleanest molds (and more of 'em) . . . with the easiest preparation . . . start using STEVENS Liquid Parting now. Contact your local STEVENS Sales Representative today, and learn why more foundries use STEVENS Liquid Parting . . . than any other brand!

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

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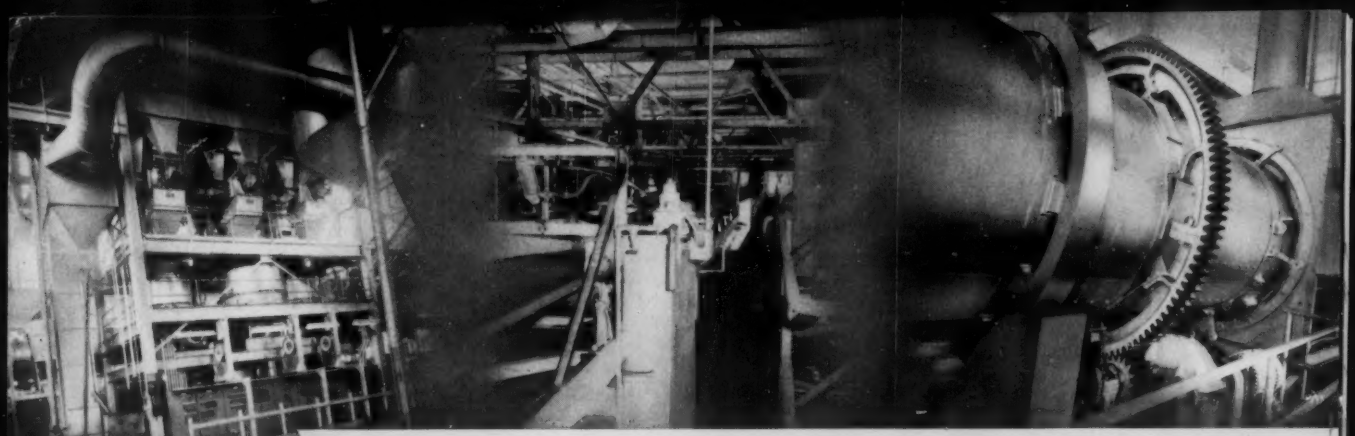
BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS NEW HAVEN SPRINGFIELD (OHIO)



Another BARTLETT-SNOW CLEVELAND 5, OHIO

INSTALLATION

In a Large Midwestern Automotive Foundry

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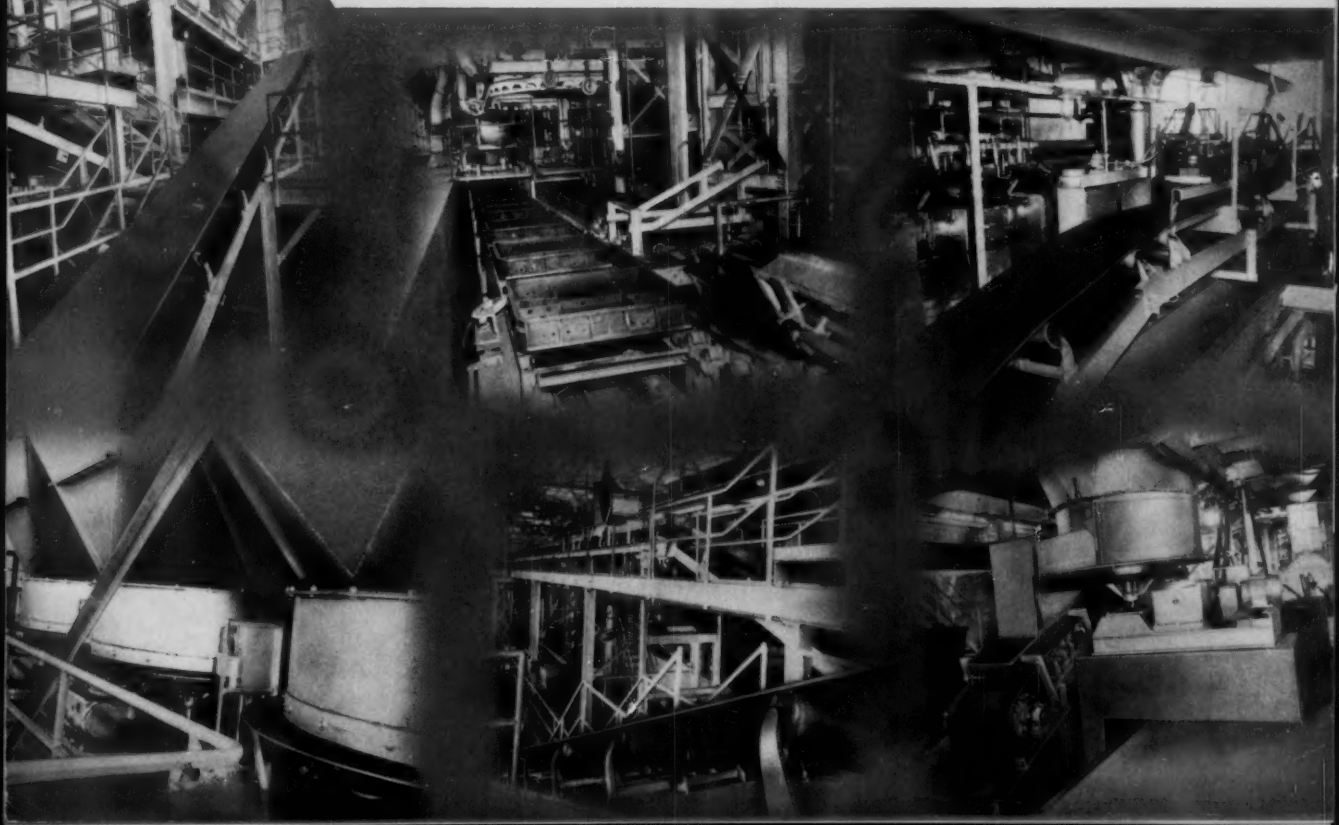
Designers, Engineers, Fabricators and Erectors of Foundry Equipment

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